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United States Department of Agriculture
Bureau of Animal Industry



Mr. Harbison
Animal Husband.

Confidential Report

of conference of
Representatives of U. S. Department
of Agriculture, and State
Experiment Stations

engaged in
Soft Pork Investigations

Held in Asheville, N. C.,

April 30, May 1, 2, and 3, 1929.

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Persons in Attendance, by Stations

Georgia	F. R. Edwards
Indiana	C. M. Vestal
Mississippi	P. G. Bedenbaugh
North Carolina	E. H. Hostetler
Do	J. O. Halverson
South Carolina	E. G. Godbey
Do	L. V. Starkey
Tennessee	M. Jacob
Virginia	R. E. Hunt
U. S. Livestock Experiment Farm, Jeanerette, La..	W. T. Cobb
U. S. Department of Agriculture.....	E. Z. Russell
Do.	O. G. Hankins
Do.	N. R. Ellis
Do.	J. H. Zeller
Swift & Company, Moultrie, Ga.....	H. McDowell

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Report of Proceedings

The conference convened Tuesday morning, April 30, at the Battery Park Hotel in Asheville, ^{N.C.} Mr. Russell presiding. The following general committee was appointed to consider results of the various lines of work and to recommend such statements or conclusions as seemed justified. This committee also was charged with the responsibility of recommending a program of work for 1929-30.

E. G. Godbey, Chairman

N. R. Ellis

O. G. Hankins

E. H. Hostetler

C. M. Vestal

The following subcommittees ^{were} /appointed to deal with specific lines of work:

(1) Soybean

C. M. Vestal, J. H. Zeller, M. Jacob.

(2) Peanut, rice by-products, heredity

E. H. Hostetler, N. R. Ellis, W. T. Cobb

(3) Quality and palatability of pork, added oil, Beltsville special experiments and studies of data.

O. G. Hankins, J. O. Halverson, E. H. Hostetler

(4) California work, Beltsville bloodmeal experiments, dressing percentage study.

E. Z. Russell, P. G. Bedenbaugh, C. M. Vestal

(5) Cull navy bean, cowpea, velvet bean

E. G. Godbey, R. E. Hunt, F. R. Edwards.

Corn and Soybean Variety Study (Hogged-Down and Dry-Lot)

The following report prepared by Edgar Martin of the Arkansas Station was read. Mr. Martin was unable to attend the conference.

VARIETIES OF SOYBEANS FOR HOGS

Method of planting.-- The planting was done with a two-row corn planter at the rate of two rows of soybeans to eight rows of corn, except the check lot which was all planted to corn.

Varieties.-- Laredo, Virginia, and Mammoth Yellow soybeans, and yellow corn were used for ^{the} plantings. The same varieties of soybeans and corn were used for feeding in the corresponding check lots.

The Virginia soybeans were ready for the hogs about two weeks before the laredos and nearly a month before the Mammoth Yellows.

Feeding.-- At the beginning of the trial, corn was kept knocked down in the field, and later snapped corn was kept on the ground near the water and the shade. This probably accounts for the higher finish and better general results than those obtained for the previous year. There was always plenty of beans for the hogs in all of the lots.

Except when supplied in the field, the materials used were fed in self feeders (see note under Table 1 for details of rations for different lots).

The hogs used.-- All the hogs used were bred and developed on the experiment station farm. Table 1 gives the average weights for the different lots, and the actual spread in weight for all of the hogs used was from 102 to 145 lbs.

The killing results.--The average refractive index readings for the various lots are shown in Table 1. The committee rating for lot 1 was 5H, 4MH, 2MS and IS; for lot 1C, 6H; for lot 2, 4H, 6MH, and 2S; for lot 2C, 4H and 2MH; for lot 3, 3H 5MH, 2MS, and IS; for lot 3C, 5H and 1MS, and 1MS; for lot 4, 10H and 2MS; for lot 4C, 5H and 1MH.

It is interesting to note that all three of the lots that hogged off soybeans have the same refractive index reading, 1.4598, and that the check lots receiving the same beans in the feeder on Sudan-grass pasture are considerably harder than the corresponding field lots.

The hogs from the corn-and-tankage lots were considerably firmer than the others as should be expected.

TABLE 1.- Soybeans for Hogs, Hogged Down in Field with Check Hogs on Sudan-Grass Pasture, September 14 to November 9, 1928.

Lot No.	Pigs in lot	Av. daily gain	Av. initial weight	Av. closing weight	For 100 lbs. gain	Corn	Supple-ment	Miner-als	Average refractive index
1*	12	1.44	12.66	207.2	--	--	--	11.0	1.4598
1C	6	1.92	131.3	239.0	414.2	18.6	--	7.9	1.4594
2*	12	1.69	126.4	221.1	--	--	--	9.7	1.4598
2C	6	1.97	128.7	238.7	401.0	21.7	--	8.8	1.4594
3*	12	1.67	126.1	219.8	--	--	--	9.7	1.4598
3C	6	1.90	129.2	235.6	401.3	22.4	--	8.0	1.4595
4*	12	1.88	126.0	228.9	--	21.0	--	4.3	1.4593
4C	6	1.98	125.0	235.7	393.4	23.8	--	2.3	1.4592

*Lots 1, 2, 3, and 4 received yellow corn in the field, and lots 1C, 2C, 3C, and 4C had yellow corn supplied in self feeders on Sudan-grass pasture. All lots had free access to a mineral mixture consisting of bone meal 50, 16% super phosphate, 25, ground limestone 25, and common salt 5 parts by weight. The differences in the supplemental feeds were as follows:

Lot 1, Laredo soybeans, grazed
 Lot 2, Virginia soybeans, grazed
 Lot 3, Mammoth Yellow soybeans, grazed
 Lot 4, Tankage in self feeder
 Lot 1C, Laredo soybean grain in self feeder
 Lot 2C, Virginia soybean grain in self feeder
 Lot 3C, M. Yellow soybean grain in self feeder
 Lot 4C, Tankage in self-feeder

Mr. Vestal of Purdue University Agricultural Experiment Station presented the following report:

Soybean Variety Experiment

In the fall of 1928 nine lots of hogs were fed to compare varieties of soybeans used as supplement to corn. Six lots of these hogs were fed in dry lots. Three lots were used to hog off corn and soybeans. Well-grown feeder hogs averaging approximately 129 pounds were used in all of the lots. Ten hogs were fed in each lot. The specific studies included in the experiment were as follows:

1. To compare soybeans of different varieties as supplements to corn when grown and hogged off with the corn.
2. To compare soybeans of different varieties as supplements to corn for fattening hogs in dry lot.
3. To determine the effect of different varieties of soybeans on the quality of pork produced.

The lots and rations were as follows:

Dry Lot

- Lot 1. Shelled corn, 60% tankage and mineral mixture self-fed free choice.
- Lot 2. Shelled corn, whole Manchu soybeans and mineral mixture self-fed free choice.
- Lot 3. Shelled corn, whole Dunfield soybeans and mineral mixture self-fed free choice.
- Lot 4. Shelled corn, whole Midwest soybeans and mineral mixture self-fed free choice.
- Lot 5. Shelled corn, whole Mammoth Yellow soybeans and mineral mixture self-fed, free choice.
- Lot 6. Shelled corn whole Manchu, Dunfield and Midwest soybeans and mineral mixture self-fed, free choice.

Corn Field

- Lot 7. Corn and Midwest soybeans grown together and hogged down, mineral mixture self-fed.
- Lot 8. Corn and Dunfield soybeans grown together and hogged off, mineral mixture self-fed.
- Lot 9. Corn and Manchu soybeans grown together and hogged off, mineral mixture self-fed.

All hogs had access to pressed block salt.

Mineral mixture: 10 lbs. limestone dust; 10 lbs. special steamed bone meal; and 1 lb. flake salt.

The hogs were started on feed September 26 and were fed for a period of 56 days. Following the feeding period the hogs in the experiment were shipped to the Bureau of Animal Industry, Washington, D.C. for slaughter and carcass tests.

The following table gives a summary of the results from the 9 lots of hogs.

Summary of Feeding Results (Soybean Variety Experiment)

51 days, September 26 to November 21, 1928

Variety of soybeans	Lot 1	Lot 2	Lot 3	Lot 3*	Lot 8*	Lot 4	Lot 7	Lot 5	Lot 6
Check	Manchu	Manchu	Manchu	Dunfield	Dunfield	Midwest	Midwest	Manchu	Dunfield
Method of feeding	Dry lot	Dry lot	Hogged	Dry lot	Hogged	Dry lot	Hogged	Dry lot	Dry lot
Ave. initial weight, pounds	129	129	129	131	129	129	129	129	129
" gain	108	92	96	105	96	103	86	103	107
" final	237	231	235	236	235	231	215	231	236
" daily gain	1.93	1.64	1.71	1.81	1.71	1.82	1.54	1.82	1.91
Ratio corn to soybeans	---	7.9:1	---	4.4:1	---	6.1:1	---	4.2:1	3.7:1
" " tankage	14.3:1	---	---	---	---	---	---	---	---
Ave. thickness of back fat (m.m.)	51	47	46	48	49	47	44	48	51
Committee grading:									
Hard	5	1	0	0	3	1	3	1	2
Medium hard	3	2	3	1	3	4	2	2	2
" soft	2	3	4	5	2	4	4	4	1
Soft	0	4	5	3	1	1	2	3	5
Ave. refractive index	1.4593	1.4599	1.4603	1.4600	1.4598	1.4600	1.4599	1.4602	1.4603

* One hog from Lot 3 and 1 hog from Lot 8 were not shipped for slaughter test due to sickness and accident.

Mr. Bedenbaugh of the Mississippi Agricultural Experiment Station presented the following report:

SOYBEAN VARIETY STUDY

1. Self-feeding shelled corn, whole soybeans, and mineral mixture free choice in dry lot to compare the palatability of varieties and the relative effects of the beans on the gains of hogs and quality of carcass.
2. Self-feeding high and low oil content varieties with mineral mixture in dry lot to determine the relative firmness of carcass as influenced by same.
3. Hogging down corn and soybeans, with mineral mixture self-fed, using the same varieties of beans as in dry lot to get a relative comparison of carcass when hogging down versus self-feeding in dry lot.

Procedure. All experiments started and ended the same dates. Lot 1 was used as a check lot and self-fed corn and tankage with mineral mixture free choice in dry lot. Lots 2, 3, 4, and 5 were self-fed Mammoth Yellow Laredo, Manchu, Laredo and Mammoth Yellow soy beans respectively free choice with shelled corn in dry lots. Lot 6 was hogging down corn and Mammoth Yellow soy beans, and Lot 7 was hogging down corn and Laredo soy beans. Mammoth Yellow and Laredo soy beans were used as the high and low oil content test, lots 2 and 3. Analysis made by our chemist showed the Mammoth Yellow to contain 19.82 crude fat and the Laredo 15.28 crude fat. All pigs used in our experiments were bred and raised on the Experiment Station farm, and had the same care and feeding until the experiments were started. Two check pigs, with an average initial wieight of 102 pounds were slaughtered at the beginning of the test, one grading medium soft and one soft. The results of the tests are given in the following summary table:

FEEDING RESULTS OF CORN AND SOYBEAN VARIETY STUDY

September 30-November 27, 1928, (59 days)

Method of feeding	Variety of soybeans fed	Lot					Lot 6	Lot 7
		Lot 1	Lot 2	Lot 3	Lot 4	Lot 5		
		Dry lot	Dry lot	Dry lot	Dry lot	Dry lot	Hogging-down	Hogging-down
		Check lot	Yellow	Laredo	Manchu	Laredo, Mammoth Yellow	Mammoth Yellow	Laredo
Number of hogs		8	8	8	7	7	12	12
Average initial weight	(lbs)	101.87	101.25	101.75	101.14	102.57	101.75	96.41
Average final weight	(lbs)	217.62	187.25	186.37	175.00	177.57	206.75	175.60
Average gain per head	(lbs)	115.75	86.00	84.62	73.86	75.00	105.00	79.19
Average daily gain	(lbs)	1.96	1.45	1.43	1.25	1.27	1.77	1.35
Feed consumed per 100 lbs. gain		349.45	342.15	358.93	367.30	381.90	---	---
Corn "	"	311.77	229.65	271.93	315.08	277.33	---	---
Tankage "	"	37.68	---	---	---	---	---	---
Mammoth Yellow "	"	---	112.50	---	---	104.57	---	---
Laredo "	"	---	---	87.00	---	* 0.00	---	---
Manchu "	"	---	---	---	52.22	---	---	---
Proportion of Corn to tankage		8.26:1	---	---	---	---	---	---
" " " scybeans		---	2.04:1	3.12:1	6.03:1	2.74:1	---	---
Hard		7 H	---	---	1 H	---	---	---
Medium Hard		1 MH	---	---	---	---	1 MH	2 MH
Medium Soft		---	---	---	---	1 MS	2 MS	2 MS
Soft		---	8 S	7 S	5 S	4 S	7 S	4 S
Soft & Oily		---	---	1 S&O	1 S&O	2 S&O	2 S&O	4 S&O
Average refractive index (B.F.)		1.4601	1.4624	1.4617	1.4614	1.4619	1.4616	1.4619

*

Only one pound of Laredo soy beans was consumed during the feeding test.

Results

1. It is noted that when the soybeans were self-fed, the pigs relished them in the following order:

Mammoth Yellow, first
Laredo, second
Manchu, third

Evidently, the Laredo is not nearly so palatable as the Mammoth Yellow, as it is noted in Lot 5 where the pigs had free choice of the two varieties they did not consume any of the Laredo beans. Satisfactory gains were made in all of the lots. However, the lowest gains were made in Lot 4 on Manchu beans.

A study of the report of the committee grading and the refractive index indicates very little difference in the firmness of the carcasses produced on above varieties.

2. A study of amount of oil content of beans as affecting the carcass. Very little difference was to be noted in the grading of carcasses in Lot 2 consuming Mammoth Yellow beans containing 19.82% of crude fat versus carcasses of Lot 3, consuming Laredo beans containing 15.28% of crude fat.
3. There was very little difference to be noted in the grading of carcasses after hogging down corn and soybeans and those of hogs self-fed corn and beans in dry lot.

The following report was read for Mr. Robison of the Ohio Station, who was unable to be present:

Hogging Down Corn Containing Different Varieties of Soybeans

Three one-acre plots of corn were hogged down in the cooperative tests in 1928. Manchu soybeans were planted with the corn in one of these and Ebony soybeans in another. The third plot contained no beans.

The shotes used in the hogging-down trial and in the comparison of varieties of soybeans for dry-lot feeding were purebred Hampshires.

Tankage was fed at the rate of 0.4 pound daily a head to the shotes on the standing corn containing no beans. A good stand of Manchu and an exceptionally thick stand of Ebony soybeans were obtained. Beans of both varieties were left on their respective plots when the hogs were shipped November 27. The plot of standing corn with which tankage was fed produced 647.5 pounds of gain on the hogs; the corn and Manchu beans 523 pounds; and the corn and Ebony beans 461.5 pounds. Practically all of the corn on the plots as named was consumed by November 14, November

19, and November 15, respectively. After these dates harvested new corn was fed. Table 1 shows the average final weights on November 27, the average daily gains, the corn and minerals required for each 100 pounds of gain, and the committee and refractive index gradings of the carcasses.

Table 1.-- Hogging Down Corn and Different Varieties of Soybeans from Oct. 2, to Nov. 27, 1928.

	Lot 1 Standing corn Manchu soybeans Minerals	Lot 2 Standing corn Ebony soybeans Minerals	Lot 3 Standing corn Tankage Minerals
Pigs per lot	6	6	7
Initial weight per pig lbs.	102.5	103.7	102.9
Final weight per pig "	203.3	198.9	226.9
Average daily gain "	1.80	1.71	2.21
Daily feed per pig:			
Corn "	6.57	6.19	8.00
Tankage "	---	---	.40
Minerals "	.04	.04	.04
Feed per 100 lbs. gain:			
Corn "	364.77	362.41	361.27
Tankage "	---	---	18.06
Minerals "	2.48	2.44	1.61
Committee grading of carcasses:			
Hard	0	1	4
Medium hard	2	1	2
Medium soft	1	3	1
Soft	3	1	0
Refractive index grading:			
Hard	0	1	7
Medium hard	5	4	0
Medium soft	0	1	0
Soft	1	0	0

Minerals - Salt 18.4; limestone 36.8; raw bone meal 36.8, Blaubers' salt 5; iron oxide 2.97; potassium iodide 0.03.

Table 2. - Varieties of Soybeans for Supplementing Corn for Shotes in Dry Lot. Oct. 24 to Dec. 19, 1917

	Lot 5	Lot 6	Lot 7	Lot 8 corn	Lot 9 corn	Lot 10 corn	Lot 11	Lot 12 corn
	Shelled corn ground Manch. soys, miner.	Shelled corn whole Manch. soys, miner.	Shelled corn Midwest soys mineral	Shelled / Ebony soy, mineral	Shelled / Laredo soys, min.	Shelled / Virginia soys, min.	Shelled corn 5 varieties soys, mineral	Shelled tankage mineral
Pigs per lot	5	5	5	5	5	5	5	5
Initial wt. per pig	118.4	121.8	122.0	122.1	122.0	122.9	120.9	120.8
Final wt. per pig	216.9	229.9	208.6	207.1	224.0	221.2	213.0	223.4
Average daily gain	1.76	1.93	1.55	1.52	1.82	1.76	1.65	1.83
Daily feed per pig:								
Shelled corn	6.93	7.30	7.02	6.85	7.39	7.61	6.66	7.67
Supplement	.46	.41	.23	.23	.27	.23	.46	.34
Minerals	.06	.09	.08	.04	.05	.05	.09	.04
Total	7.38	7.80	7.33	7.12	7.71	7.89	7.21	8.05
Feed per 100 lbs. gain								
Shelled corn	389.85	378.38	454.22	451.53	405.82	433.57	404.96	418.58
Supplement	25.99	21.28	15.02	14.94	14.71	12.82	27.68	18.71
Minerals	3.65	4.72	4.85	2.59	2.65	3.05	5.64	2.14
Total	419.49	404.38	474.09	469.06	423.18	449.44	438.28	439.43
Per cent of supplement in ration	6.2%	5.3%	3.2%	3.2%	3.5%	2.8%	6.3%	4.3%
Committee grading cars:								
Hard	4	5	3	3	5	2	3	5
Medium hard	0	0	2	1	0	2	1	0
Medium soft	1	0	0	0	0	0	1	0
Soft	0	0	0	0	0	0	0	0
Refractive index grade:								
Hard	4	5	5	4	5	4	4	5
Medium hard	0	0	0	0	0	0	1	0
Medium soft	1	0	0	0	0	0	0	0
Soft	0	0	0	0	0	0	0	0

Lot 11 ate a total of 54 lbs. of Manchus; 22 lbs. Midwest; 26.5 lbs. Ebony; 1 lb. Laredo and 24 lb. Virginia soy beans.

At the time the shotes were turned on the plots practically all the leaves had dropped off of the Manchu beans. The Ebony beans, on the other hand, contained an immense amount of foliage. After a period of 10 days or so, however, frosts caused this variety to also shed its leaves.

Varieties of Soybeans for Supplementing Corn for Shotes in Dry Lot

Soybeans of the Manchu, Midwest, Ebony, Laredo, and Virginia varieties were obtained for the comparison. This furnished one brown, two yellow, and two black varieties. One of the yellow and one of the black, or the Manchu and Ebony beans, are regarded as varieties which are relatively high in oil. While the other yellow and the other black variety or the Midwest and Laredo beans are considered varieties which normally have rather low oil contents. An attempt was made to secure beans which were still lower in oil but this was not successful.

Besides feeding each variety of beans to a different group of five shotes, all five varieties, placed in separate compartments of the feeders, were kept before another group of shotes. The beans fed this lot were rotated each week as was done in the earlier, dry lot, variety comparisons.

Ground Manchu soy beans were fed free-choice to still another group of shotes. A comparison of whole and ground soybeans for self feeding in this manner was thus provided. By grinding both, the corn and beans and mixing them in definite proportions it would be possible to force pigs to take the quantity of beans required to balance the ration.

Although the shotes made good gains none of the seven lots getting beans took a sufficient quantity to balance their ration according to recognized feeding standards. The amounts consumed ranged from 2.8 to 6.3 per cent of the total ration. The percentage of beans taken by each lot is shown in Table 2. In a long-time experiment possibly the effect of a low protein intake would be more pronounced.

The shotes were kept indoors during the trial. Toward the close of the period some of them became crampy or stiff. Two of them were so badly crippled that they were removed from the car and slaughtered at Pittsburg.

Both the committee and refractive index gradings of the carcasses are shown in Table 2. In view of the small percentages of soy beans eaten, it is not surprising that with one or two exceptions by both systems of grading the carcasses were hard or medium hard. It appeals to me that a much more satisfactory method of studying the effect of soybeans on the firmness of the pork is the one of mixing the beans with the other feeds and feeding them in definite proportions. Of course such a plan would furnish data of less value as to the relative palatability of the different varieties of soybeans.

Apparently none of the varieties used in this experiment, however, were palatable to the shotes used. For the first four weeks of the test it was necessary to feed some Midwest soybeans that were of rather poor

quality and that possibly were a little musty. After that, or for the last four weeks, new Midwest soybeans were fed. The amounts consumed by Lot 7 for the two periods of equal length were 13 and 52 pounds, respectively.

The beans consumed represented 1.2 and 5.4 per cent of the total ration for the two periods as named. Lot 11, having access to the five varieties of beans ate 3 pounds of the old Midwest beans during the first four weeks and 19 pounds of the new Midwest beans during the last four weeks. During the last four weeks they ate more of the Midwest soybeans than of any other one variety.

Mr. Hunt reported as follows on Soybean variety work conducted at the Virginia Agricultural Experiment Station.

SOYBEAN VARIETY EXPERIMENT

Six lots of hogs of Poland-China-Berkshire breeding were used in the soybean variety, dry-lot and hogging down experiment.

Five lots of these hogs were self-fed in dry lot to compare varieties of soybeans used as supplement to corn. One lot of 19 hogs was used in field work for hogging down. All lots had free access to a mineral mixture composed of 10 parts ground limestone, 10 parts 16% superphosphate, and 1 part common salt. The results of these tests are summarized as follows:

Variety of Bean	Mammoth Yellow		Check Lot		Mammoth Yel.	
	Virginia	Virginia	Wilson Shelled corn	Wilson Shelled corn	Old Dominion	Old Dominion
	Wilson Black	Wilson Black	Black Mineral	Black Mineral	Yellow	Black
Method of feeding	Dry lot	Dry lot	Dry Lot	Dry lot	Dry lot	Hogging-down
No. pigs	8	8	7	8	7	19
No. days on experiment	61	61	61	61	61	89
Average initial weight	152	137	147	146	146	126
Average final weight	252	142	243	217	236	232
Average daily gain	100	105	96	71	90	106
Average gain	1.64	1.72	1.57	1.16	1.47	1.19
Hard	---	---	1 H	---	---	---
Medium Hard	1 MH	1 MH	1 MH	1 MH	2 MH	---
Committee grading						
Medium Soft	2 MS	2 MS	5MS	6 MS	---	3 MS
Soft	5 S	5 S	---	1 S	5 S	16 S
Refractive index	1.4601	1.4603	1.4598	1.4598	1.4603	1.4606

The variety of corn used in the field work was Reid's X Leaming. Six rows of corn were planted to 2 rows of soybeans. Observation showed that in hogging-down the pigs preferred the Mammoth Yellow variety of soybeans to any of the other 3 varieties. Wilson Black and Virginia soybeans were eaten with apparently equal relish. The Old Dominion variety was apparently the last choice and a few of the beans were left on the ground after the pigs had the run of the field for a period of 89 days.

Mr. Hankins presented the following reports on soybean variety experiments conducted at Beltsville:

Four varieties of soybeans were planted for use in this experiment, as follows:

Hahto
Manchu
Sooty
Virginia

Owing to a shortage of seed of the Sooty soybean variety it was necessary to finish out the acreage with beans of the Old Dominion variety. Two acre lots were planted to corn and the Sooty variety of soybeans while one acre was planted to corn and Old Dominion soybeans. The hogs were on Sooty soybeans for 39 days and were turned in on the Old Dominion beans 7 days prior to the close of the test.

Hogs Used in Experiment

Five lots of 12 hogs each were used in the hogging-down experiments. Purebred representatives of the Chester-White, Duroc-Jersey, Poland China, and Tamworth breeds were used in the different lots.

In addition to access to corn and soybeans mineral mixture was available in a self-feeder in all lots. The check lot, in addition to hogging down corn was self-fed tankage and mineral mixture.

Hogging Down Corn and Four Different Varieties of Soybeans
in separate lots (Sept. 28 to Nov. 28, 1928)

Starting Date.....	9/28	9/28	9/28	9/28	10/5
Closing Date.....	11/19	11/19	11/13	11/13	11/28
Kind of soybeans.....	Manchu	Virginia	Chas. Lot	Sooty	Hahto
No. of hogs on test	12	12	12	12	12
No. of days on test.....	52	52	46	46	54
No. hog days on test	624	624	552	552	648
Total initial weight	lbs:1540	:1541	:1541	:1569	:1524
Ave. " "	" : 128.33	: 128.42	: 128.42	: 130.75	: 127.00
Total final weight	" : 2579	: 2480	: 2516	: 2506	: 2516
Ave. " "	" : 214.91	: 206.67	: 209.67	: 208.83	: 209.67
Total gain	" : 1039	: 939	: 975	: 937	: 992
Average gain	" : 86.58	: 78.25	: 81.25	: 78.08	: 82.67
Average daily gain.....	" : 1.67	: 1.50	: 1.77	: 1.70	: 1.53
Total mineral consumed	" : 113	: 125	: 30	: 110	: 96
Total tankage consumed	" :	:	: 325	:	:
Mineral consumed per 100 lbs.gain "	" : 10.86	: 13.31	: 3.08	: 11.74	: 9.68
Tankage consumed per 100 lbs.gain "	" :	:	: 33.33	:	:
Numerical value carcass grade.....	1.91	2.08	1.00	1.33	2.33
Ave. letter value carcass grade	MS	MS	MH	MH	MS

Dry-Lot Corn and Soybean Feeding Experiment at
Beltsville, Md., July 25, 1928 to January 27, 1929

The dry lot experiments were conducted as supplementary to the hogging-down corn and soybean variety experiments. The plan was to feed the same varieties of soybeans in dry lot and in the field.

The same initial weight study was made with pigs in dry lot as in hogging-down, with the exception of the pigs fed Sooty soybeans. Owing to the fact that Sooty beans could not be obtained for the feeding trial it was necessary to wait until the new crop of beans was harvested. This accounts for the fact that this lot was not started until December 6, 1928.

This experiment consisted of 6 lots with 10 hogs to the lot. The different lots started at different times, as the hogs reached the average starting weight of 125 to 130 pounds.

Feeding results of this experiment are found in the following summary tables.

Results of Dry-Lot Soybean Feeding Experiment
(July 25, 1928 - January 27, 1929)

Variety of Soybeans	17.9 Hahto	18.9 Manchu	17.9 Virginia	12.9 Sooty	All four varieties	Check Corn, Tankage
No. hogs on test.....	10	10	10	10	10	10
No. hog days on test....	490	520	630	520	560	620
Total initial weight, lbs	1226	1310	1311	1528	1282	1223
Average initial weight "	122.6	131.0	131.0	152.8	128.2	122.3
Total final weight ... "	2073	2126	2128	2154	2094	2059
Average final weight .. "	207.3	212.6	212.3	215.4	209.4	205.9
Total gain..... "	847	816	817	626	812	836
Average gains..... "	84.7	81.6	81.7	62.6	81.2	83.6
Average daily gain.... "	1.73	1.57	1.30	1.20	1.45	1.35
Total feed consumed:	3163	3368	3953	2828	3648	3957
Corn	2735	2915	3310	2063	2747	3459
Hahto	355	---	---	---	*286	---
Manchu	---	375	---	---	183	---
Virginia	---	---	571	---	215	---
Sooty	---	---	---	525	---	---
Old Dominion	---	---	---	120	127	---
Tankage	---	---	---	---	---	480
Mineral mixture	73	78	72	70	90	18
Feed consumed per 100						
pounds gain:	373.44	412.75	483.84	451.75	449.26	473.32
Corn..... "	322.91	357.23	405.14	329.55	338.30	413.76
Hahto.... "	41.91	---	---	---	35.22	---
Manchu	---	45.96	---	---	22.54	---
Virginia..... "	---	---	69.89	---	26.48	---
Sooty & Old Dominion	---	---	---	111.02	15.64	---
Tankage	---	---	---	---	---	57.42
Mineral mixture "	8.62	9.56	8.81	11.18	11.08	2.14
Ratio Corn to Soybeans	7.70:1	7.77:1	5.80:1	2.97:1	3.39:1	7.2:1 corn to tankage
Numerical value	1.30	1.90	0.7	2.40	2.10	0.9
Average carcass grade						
per lot. Letter value	MH	MS	MH	MS	MS	MH

* Supply of Hahto exhausted Oct. 5, 1928

Comparison of Carcass Grades - Dry Lot vs. Hogging-Down Experiment

Variety of Soybeans	Hahto	Manchu	Virginia	Sooty	Check lot Corn and Tankage	All four Varieties
Dry Lot						
Carcass Grade-						
Hard	---	---	5	---	4	1
Medium hard.....	7	3	3	1	4	---
Medium soft.....	3	5	2	4	2	6
Soft	---	2	---	5	---	3
*Numerical average.....	2.30	2.92	1.70	3.40	1.80	3.10
**Letter average.....	ME	MS	ME	MS	ME	MS
Refractive Index Value	1.4603	1.4602	1.4604	1.4607	1.4596	1.4605
Hogging down in field:						
Carcass Grade -						
Hard	---	---	---	---	3	
Medium hard.....	2	3	2	8	6	
Medium soft.....	4	7	7	4	3	
Soft.....	6	2	3	---	---	
*Numerical average	3.33	2.90	3.08	2.33	3.00	
**Letter average	MS	MS	MS	MH	MS	
Refractive index value	1.4604	1.4605	1.4607	1.4600	1.4597	

*Numerical average; Hard 50-1.49; Medium hard 1.50-2.49; Medium soft 2.50-3.49;
Soft 3.50- 4.49

** Letter average H, Hard; MH, Medium hard; MS, Medium soft; S, Soft.

Mr. Ellis presented the following report on a study of the variation in oil content of soybean varieties:

In the following table are given some averaged results obtained from a study of the variation in the oil content of soybeans. A total of 88 samples are included covering 8 years of feeding. Many of the analyses were made at the State stations. The fat content has been calculated to a uniform water content, namely, 10 per cent. The minimum, average, and maximum per cent of fat for each variety is given together with the content as given in various bulletins of the Department (Farmers' Bulletin 1520), as well as the Stations (Ohio 384, Ind. 238 and Md. 277).

In numerous cases there are ranges between minimum and maximum amounting to 3, 4, and 5 per cent, as much in fact as between varieties. The Old Dominion variety was chosen for feeding tests at Beltsville because of the low oil content reported in F. B. 1520. The average of 3 samples was 4 per cent above that reported which placed it on practically the same basis as Mammoth Yellow, a medium-high-oil variety. The other low varieties such as Sooty and Laredo likewise show oil contents higher than reported in F. B. 1520. These figures indicate that the feeding comparison of varieties which have been conducted within the past year to compare the effect of the oil content can not be expected to show any appreciable difference in firmness as the basis of oil content.

A summary on the difference in oil content between the beans used for planting and those harvested shows that out of 16 sets representing 9 varieties, 4 differed by less than 0.5 per cent; 7 by 0.5 to 1.5 per cent. Three by 1.5 to 2.5 per cent, 1 by 2.5 to 3.5 per cent, and 1 by 3.5 to 4.5 per cent. Thus approximately 20 per cent differed by less than 1.5 per cent.

Oil content of 88 samples of soybeans

Variety	No. of Samples	Fat on 10% Water			Fat %			
		Min.	Ave.	Max.	F. B. 1520	Ohio.384	Ind. 238	Md.277
Herman	1	---	20.4	---	18.5	---	---	---
Hamilton	1	---	20.1	---	19.2	19.4	---	---
Morse	4	18.2	19.3	21.3	18.1	---	---	---
Manchu	11	16.1	18.7	20.8	18.9	20.0	17.0	---
Mammoth Yellow	12	16.2	18.2	20.5	18.6	16.1	---	---
Dixie	1	---	18.2	---	19.3	---	---	---
Old Dominion	3	16.8	17.9	19.0	13.8	---	---	---
Midwest	4	15.3	17.9	20.0	15.4	16.8	17.1(1913) 14.9(1919)	19.5
Dunfield	1	---	17.8	---	19.8	---	---	---
Haberlandt	4	16.5	17.7	19.4	19.4	---	---	---
Virginia	22	13.5	17.5	19.5	17.9	16.6	---	20.2
Biloxi	3	16.6	17.3	18.9	20.1	---	---	---
Hahto	6	14.4	17.0	18.1	17.9	---	---	---
Wilson	9	15.4	16.3	17.2	18.4	17.3	---	19.2
Ebony	1	---	16.0	---	18.4	14.4	---	---
Sooty	2	15.8	15.9	15.9	12.9	---	---	---
Laredo	3	14.8	15.0	15.2	14.0	---	---	---

Corn and Soybeans in Definite Proportions

Dr. Jacobs reported as follows on the results of feeding soybeans with corn in definite proportions.

This experiment was conducted at the Tennessee Experiment Station at Knoxville. It was begun on January 25, 1929 and terminated on May 19, 1929, a period of 115 days. There were included 24 purebred Duroc-Jersey pigs which were divided into 3 groups of 8 pigs each, and designated as Lots I, II, and III.

Lot I was self-fed on a ground mixture consisting of 12 parts by weight of shelled corn to 1 part by weight of soybeans and mineral mixture.

Lot II was self-fed on a ground mixture consisting of 9 parts by weight of shelled corn to 1 part by weight of soybeans and mineral mixture.

Lot III was self-fed on shelled corn, tankage, and mineral mixture.

The soybeans fed to Lots I and II were of the Mammoth Yellow variety. Mineral mixture fed to all three groups was made up as follows:

Powdered limestone-----	10 parts
Super Phosphate (16%)-----	10 parts
Sodium Chloride-----	1 part

Two check pigs, also Duroc-Jerseys, were shipped to Beltsville for carcass test at the beginning of the experiment. One of these pigs weighing 110 pounds killed soft, and the other weighing 202 pounds killed hard.

At the end of the experiment, all three groups were shipped to Beltsville for carcass grading with the following results:

Lot I (Corn and soybeans 12:1)	5 medium soft	
	3 medium hard	Av. R.I. = 1.4604
	1 soft	
Lot II (Corn and soybeans 9:1)	3 medium soft	Av. R.I. = 1.4604
	4 medium hard	
Lot III (Corn and tankage)	7 hard	Av. R.I. = 1.4594
	1 died as result of injury enroute	

All pigs used in the experiment were bred on the University Farm.

The feeding results are given below in tabulated form:

	Rate and cost of Gains		
	Corn & Soybeans (12:1) Mineral Mixture LOT I	Corn & Soybeans (9:1) Mineral Mixture LOT II	Corn, Tankage Mineral Mixt. LOT III
Average Number days in experiment	115	115	115
Number pigs in each lot	8	8	8
Average initial weight of pigs	111.1	111.7	111.5
Average final weight of pigs	211.56	214.88	298.0
Average gain per pig	100.46	103.18	186.5
Average daily gain per pig	.87	.89	1.62
Average cost per 100 pounds Gain	\$12.87	\$12.01	\$9.47

Cost of Feedstuffs and Feed Requirements

Feed	Average Market Price	Pounds of Feed for 100 pounds Gain		
		LOT I	LOT II	LOT III
Corn	\$1.12 per bu.	557.92	506.12	430.8
Tankage	\$73.00 per ton			23.1
Mineral Mixt.	1¢ per pound	.036	.02	.18
Soybeans	\$2.00 per bu.	50.27	56.19	
Total concentrates per 100 pounds gain		608.22	562.33	454.08

Mr. Hunt reported as follows on Corn and Soybeans(Definite Proportions) work conducted at the Virginia Agricultural Experiment Station.

Three lots of 10 hogs each were used in a definite proportion, corn and soybean test. The hogs were of Duroc-Jersey breeding.

The lots and rations were as follows:

- Check lot. Ground corn 10.5 parts; tankage 1 part, mixed and self-fed, free choice, with mineral mixture.
- Lot 1. Ground corn 9 parts, ground soybeans 1 part, mixed and self-fed, free choice, with mineral mixture.
- Lot 2. Ground corn 12 parts, ground soybeans 1 part, mixed and self-fed, free choice, with mineral mixture.

Mineral mixture which was fed in a separate compartment of the self-feeder was composed of:

10 parts wood ashes
10 " 16% superphosphate
1 " common salt

The results of this experiment are summarized as follows:

	Check lot	Lot 1	Lot 2
	Corn 10.5	Ground corn 9	Ground corn 12
	Tankage 1	" soybeans 1	" soybean 1
	Mineral	Mineral	Mineral
Days on experiment	110	110	110
Average initial weight (lbs)	81	83	75
Average final weight (lbs)	213	226	202
Average gain (lbs)	132	143	127
Average daily gain (lbs)	1.20	1.30	1.16
Feed consumed per 100 lbs. gain	419.75	350.39	375.29
Ground corn " " " "	378.52	310.92	341.87
" soybeans " " " "	---	34.57	28.52
Tankage " " " "	35.93	---	---
Mineral " " " "	5.30	4.90	5.50
Distribution carcass grade:			
Hard-----	---	---	---
Medium hard -----	1	---	---
Medium soft -----	8	3	1
Soft-----	1	7	9
Average refractive index (back fat)	1.4599	1.4605	1.4605

Mr. Zeller presented the following report on the results of feeding soybeans with corn in definite proportions at the Beltsville Farm:

Two lots of 10 hogs each were started on test and fed a ration of 9 parts ground corn and 1 part ground Virginia soybeans. Conditions were the same in both lots except that a different mineral mixture was fed each lot.

Lot 1 (Pad. N.) received a mineral mixture of :

10 parts ground limestone
10 parts steamed bonemeal
1 part common salt

Lot 2 (Pad. O) received a mineral mixture of:

10 parts wood ashes
10 parts superphosphate
1 part common salt

The feed was mixed in the above proportions and self-fed. The mineral mixture was self-fed in a separate compartment of the self-feeder.

Feeding Results of Corn and Soybeans (9:1) Definite Proportions, at Beltsville, Md., (July 25-November 13, 1928).

	Lot 1	Lot 2
No. hogs on test	10	10
No. hog days on test	1060	1110
Total initial weight	978	982
Average initial weight	97.8	98.2
Total final weight	2217	2200
Average final weight	221.7	220.0
Total gain	1239	1218
Average gain	123.9	121.8
Average daily gain	1.17	1.097
Total feed consumed	6064	5909
Cornmeal	5382	5197
Ground soybeans	598	577
Mineral mixture*	84	135
Feed consumed per 100 lbs. gain.....	489.42	485.13
Cornmeal	434.38	426.68
Ground soybeans	48.26	47.37
Mineral mixture	6.78	11.08
* Lot 1 Mineral mixture	Lot 2 Mineral mixture	
10 parts ground limestone	10 parts wood ashes	
10 parts steamed bone meal	10 parts superphosphate	
1 part common salt	1 part common salt	

Mr. Hankins presented and discussed the following summary tables of results from feeding 9 and 12 parts of corn with 1 part soybean:

SUMMARY OF CORN AND SOYBEANS
(9:1 mixture)

No. hogs	Days fed	Final weight	Carcass grade	R. I. Back fat	Initial weight	Total gain	Ave. daily gain
Over 100 pounds initial weight							
52	4,524 87	232	25MH 27H	31,205 600	6,052 116	6,048 116	1.34
33	3,026 92	220	21MS 12S	19,999 606	3,708 112	3,567 108	1.18
Under 100 pounds initial weight							
27	2,537 94	203	16MH 11H	16,218 600.6	2,386 88	3,110 115	1.23
72	7,263 101	195	37MS 35S	43,676 606.6	6,357 88	7,708 107	1.06
Average all weight and grades							
All hogs 184	17,350 94	211.5	38H 41MH 58MS 47S MS	111,098 603.7	18,503 100.5	20,433 111	1.18

SUMMARY CORN AND SOYBEANS IN MIXTURES

(12:1 mixture)

No. hogs	Final weight	Carcass grade	R. I. B. fat	Initial weight	Total gain	Days fed	Average daily gain
Over 100 pounds initial weight							
24	5805	13 H	14382	2966	2839	1932	
	241	11WH	559	123.5	118	81	1.47
15	3477	3 S	9085	1846	1631	1452	
	232	12MS	605	123	109	97	1.12
Under 100 pounds initial weight							
7	1333	1 H	4189	588	745	784	
	190	6MH	598	84	106	112	.95
37	7053	23 S	22402	2893	4160	3953	
	191	14MS	605	78	112	107	1.05
Average all weights and grades							
83	17668	14 H	50058	8293	9375	8121	
	213	17MH	603	100	112	98	1.15
		26MS					
		26 S					
		MS					

Soybean Grazing Work

Mr. Godbey of the South Carolina Station reported as follows on the results of soybean grazing experiments:

The South Carolina Station has completed three years' work comparing full and limited feeding of corn and of corn and tankage for hogs that are grazing on soybeans. This report is a summary of two years' work in which the carcasses were graded.

Each year hogs were turned on green Herman beans on June 29th. At this time the beans were about 20 inches high. This green grazing period lasted for from 56 to 63 days, after which all lots were turned on mature Herman beans. When this variety was exhausted Mammoth Yellow and Biloxi were used for finishing.

High grade or purebred hogs that had been treated for cholera and worms were used in this test.

A mineral mixture of 10 parts ground limestone, 10 parts 16% acid phosphate and 2 parts salt was self fed to all lots.

The following analyses of feeds were made by the Chemistry Department.

	Moisture	Ash	Protein	Fiber	H.F.E.	Fat & Oil
Corn - 1927	12.50	1.50	11.56	1.95	68.59	3.90
Corn - 1928	12.50	1.80	9.09	2.90	69.96	3.75
Tankage - 1927	8.85	17.25	61.69	0 0	0 0	13.10
Tankage - 1928	8.05	17.40	57.69	1.11	2.43	13.32
Herman beans - 1927	8.50	6.00	37.25	10.55	18.40	19.30
Herman beans - 1928	13.90	4.70	33.06	7.00	21.84	19.50
Mammoth Yellow beans - 1927	9.00	5.00	34.03	11.00	22.12	18.85
Mammoth " " 1928	7.40	5.30	35.25	9.70	24.63	17.72
Biloxi beans 1927	10.50	4.75	36.00	11.35	19.90	17.50

Perhaps the most interesting thing, to this body at least, shown by these analyses is that the Herman beans are high in fat and oil, - the average fat and oil percentage being 19.40 for Herman, 18.27 for Mammoth Yellow, and 17.50 for Biloxi.

SUMMARY OF FEEDING RESULTS

		Lot 1	Lot 2	Lot 3	Lot 4	Lot 5
		Corn & tankage Dry lot.	2 1/2% Corn & soybean forage	2 1/2% Corn & soybean forage	Full Feed Corn & soybean forage	Full Feed Corn & tankage and S. B. forage
Pigs	(Green)	9.83	10	10	8.5	9.5
Per	(Mature)	8.75	10	10	8.5	9.0
Lot	(Total)	9.22	10	10	8.5	9.23
Days	(Green)	59.5	56	56	59.5	59.50
on	(Mature)	72	83.5	79.5	69.0	56.00
Test	(Total)	131.5	139.5	135.5	128.5	115.50
Av. In-	(Green)	42.15	42.15	42.20	42.86	42.67
itial	(Mature)	83.05	80.25	77.30	103.18	110.25
wt.						
Av. Fi-	(Green)	85.44	80.25	77.30	103.18	108.42
nal wt.	(Mature)	202.38	201.30	201.80	200.11	200.59
Gain per	(Green)	38.99	38.10	35.10	60.32	65.74
hog	(Mature)	103.77	121.05	124.50	96.93	90.34
	(Total)	139.71	159.15	159.60	157.25	155.18
Av. daily	(Green)	.65	.68	.63	1.00	1.10
gain	(Mature)	1.48	1.46	1.57	1.40	1.63
	(Total)	1.08	1.15	1.18	1.23	1.35
Total feed	(Corn)	4382.25	3555.90	3165.75	3756.01	3916.30
consumed.	(Tankage)	533.68		190.65		232.92
	(Total)	4915.93	3555.90	3356.40	3756.01	4149.22
	(Mineral)	70.00	92.50	75.00	74.23	59.65
	(Forage)		2.21	2.08A	1.15	1.03
Feed per	(Corn)	339.09	233.58	198.32	281.16	272.53
100 lbs.	(Tankage)	41.61		11.95		16.31
gain	(Total)	380.70	223.58	210.27	281.16	288.84
	(Mineral)	5.26	5.82	4.70	5.55	4.13
	(Forage)		.14	.13	.09	.07
Feed	(Green)	8.69	5.95	6.83	6.56	6.70
cost Per	(Mature)	8.43	6.31	5.85	6.78	7.24
100 lbs.	(Total)	8.49	6.21	6.05	6.73	7.02
gain						

Price of feeds: Corn.....\$1.12 per bu.
 Tankage.....80.00 per ton
 Soybeans.....12.00 per acre
 Mineral.....20.00 per ton

Faster gains were made by hogs receiving full feed, while cheaper gains were made in the limited-fed lots. The lot receiving limited corn made the cheapest gains on green beans while limited corn and tankage produced the cheapest gains for the mature and total periods.

At the close of the feeding test the hogs were shipped to a local packing house where carcass gradings were made. Fat samples were sent to Washington for refractive index readings.

The following table summarizes the grading results.

CARCASS GRADINGS

	: Lot 1	Lot 2	Lot 3	Lot 4	Lot 5
No. hogs graded	: 16	: 17	: 20	: 15	: 17
(Hard	: 7	:	:	:	:
No. in each (Medium hard	: 6	:	:	: 1	: 4
grade (Medium soft	: 2	: 1	:	: 4	: 2
(Soft	: 1	: 3	: 9	: 9	: 10
(Soft & oily	:	: 10	: 11	: 1	: 1

The hogs in the check lot, with three exceptions, produced satisfactory carcasses. Most of the hogs receiving full feed in addition to soybeans produced soft or medium soft carcasses. All the hogs receiving a limited ration on soybeans produced soft or soft and oily carcasses.

Raw vs Cooked Soybeans

Mr. Robison prepared the following report on the

EFFECTS OF COOKING SOYBEANS ON THE FIRMNESS OF THE PORK

Ohio Agricultural Experiment Station

An experiment to study the effect of cooking soybeans on the firmness of the pork, which was begun November 1, 1927, was not completed at the time of last year's conference. Each of the five lots of pigs in the experiment received corn, ground alfalfa, and minerals. These feeds were supplemented with ground (raw) soybeans, (whole) cooked soybeans, soybean oilmeal, and tankage, respectively. Lots 2 and 3 were both fed cooked soybeans. Lot 3 was given all the feed they would clean up readily twice daily. In previous tests such pigs always ate more feed and made faster gains than similar ones fed raw beans. To determine whether the feeding value of the beans was increased by cooking or whether the better showing made by the pigs fed the cooked beans was due merely to a greater feed consumption as a result of the ration being more palatable. Lot 2 in the test was given cooked beans, and the total amount of feed given them was limited to the amount consumed by the pigs getting the raw beans. The results are shown in Table 1.

Table 1: Effect of Cooking Soy Beans on the Firmness of the
Pork. Pigs Fed in Dry Lot.

With the exception of the cooked beans the feeds were mixed and hand fed.

	Lot 1 Corn, ground soybeans ground alfa- lfa,minerals	Lot 2 Corn, cooked soybeans ground alfa- alfa,miner- als	Lot 3 Corn, cooked soybeans ground alf- alfa,miner- als	Lot 4 Corn, soy bean oil- meal, ground alfalfa minerals	Lot 5 Corn- tankage ground alfalfa mineral
No. of pigs-----	7	7	7	7	7
From Nov. 1, 1927 to-----	May 29	May 29	March 13	April 17	April 17
Initial weight per pig-----	44.62	44.79	44.71	44.5	44.5
Final weight per pig-----	198.07	246.93	213.43	196.79	217.21
Average daily gain-----	.73	.96	1.27	.89	1.03
Days required to gain 160 lbs.-----	219	167	126	180	155
Daily feed per pig:					
Corn-----	2.75	2.76	3.27	3.34	3.58
Supplement-----	.56	.55	.71	.47	.30
Ground alfalfa-----	.11	.11	.13	.13	.12
Minerals-----	.09	.09	.11	.10	.06
Total-----	3.51	3.51	4.22	4.04	4.06
Feed per 100 lbs. gain:					
Corn-----	376.99	286.79	258.08	377.29	348.24
Supplement-----	76.96	56.62	55.60	53.37	28.92
Ground alfalfa-----	14.41	11.71	10.53	13.86	11.85
Minerals-----	12.01	9.55	8.59	11.55	5.92
Total-----	480.37	364.66	332.80	456.07	394.93
Ave. per cent of supplement in ration	16.0 %	15.5%	16.7%	11.7%	7.3%
Committee grading of carcasses:					
Hard-----	0	0	1	2	3
Medium hard-----	0	0	1	1	2
Medium soft-----	2	0	3	2	2
Soft-----	5	7	2	2	0
Refractive index grading:					
Hard-----	0	0	0	1	3
Medium hard-----	0	0	1	2	3
Medium soft-----	2	0	0	2	1
Soft-----	4	6	5	2	0
Oily-----	1	1	1	0	0

Raw and cooked beans were compared in a test reported last year, but in that experiment the pigs were all fed for a period of 24 weeks, and the cooked-bean pigs were much heavier when slaughtered than the raw-bean pigs. In this test, three shipments of the pigs were made, so that, with the exception of Lot 2, sent the same time as Lot 1, the pigs averaged in the neighborhood of 200 pounds when slaughtered. Thus the disturbing factor of a wide variation in weight or finish was avoided.

As shown by the committee gradings and refractive indexes, cooking the beans had little effect in increasing the firmness of the fat despite the much faster gains made. The refractive indexes indicated the carcass of one pig in Lot 3 to be medium hard and those of the other 20 getting soy beans to be medium soft, soft, or oily. The average percentage of soybeans in each ration is given in the table. The percentages of beans were no greater than were needed to balance the corn and provide rations having the nutritive ratios recommended by feeding standards.

Raw and Cooked Soybeans for Growing and Fattening Pigs,
On Rape Pasture

During the summer and fall of 1928 ground raw, and whole cooked Manchu soybeans, and tankage were compared for supplementing ground corn and minerals when hand fed to pigs on rape pasture. The pigs were started at an average weight of approximately 60 pounds. Until they averaged 120 pounds in weight the raw soybeans and tankage made up 14 and 7.0 per cent of their respective rations. Thereafter, as named, they made up 11 and 5.5 per cent of the rations. The cooked beans were fed at the rate of 0.6 pound daily a head (weighed before cooking) until the pigs averaged 120 pounds in weight and 0.8 pound, thereafter. The average percentage of supplement in each ration is given in Table 2.

Table 2.- Raw and Cooked Soybeans for Growing and Fattening Pigs,
On Rape Pasture
July 11 to Nov. 7, 1928

	Lot 1. Ground corn ground soybeans minerals	Lot 2 Ground corn, cooked soybeans, minerals	Lot 3 Ground corn, tankage, minerals
No. of pigs	9	9	9
Initial weight per pig	59.93	60.93	61.09
Final weight per pig	219.21	232.39	226.39
Average daily gain	1.24	1.44	1.39
Daily feed per pig:			
Corn	4.47	4.59	5.02
Supplement	.64	.71	.32
Minerals	.13	.12	.08
Total	5.24	5.42	5.42
Feed per 100 lb. gain:			
Corn	361.68	318.85	360.94
Supplement	51.88	48.99	23.25
Minerals	10.61	8.18	5.85
Total	424.17	376.01	390.04
Average per cent of supplement in ration	12.2%	13.0%	6.0%
Carcass gradings:			
Hard	2	2	9
Medium hard	2	4	0
Medium soft	2	2	0
Soft	1	1	0
Refractive index gradings:			
Hard	2	1	8
Medium hard	3	5	1
Medium soft	2	2	0
Soft	0	1	0

Minerals: Salt 18.4; limestone 36.8; spent bone black 36.8; iron oxide 2.97;
Glauber's salts 5; potassium iodide .03.

As in previous experiments the cooked beans produced faster gains and a greater amount of gain from a given quantity of feed than did the raw beans. The difference, however, is less in the case of pigs on pasture than in the case of pigs confined in dry lots. Despite the more rapid gains, cooking apparently had no marked effect in hardening the fat. The committee gradings and refractive indexes are given in the table.

Five of the pigs from each of Lots 1 and 3 were used in the further studies on the quality of the pork.

Rice By-Products

Mr. Martin of the Arkansas Station prepared the following report on rice by-products work for publication in the proceedings of the conference, although he was unable to be present at the meeting:

Purpose of trial.-- In previous trials at this station, very poor feeding results had been obtained from rice polish and tankage with 40 to 60 lb. pigs. For this trial alfalfa hay and alfalfa meal were supplied in self feeders or in the mixture which was fed in the self feeder with the hope that it would correct the tendency of the rice polish to scour the pigs.

Procedure.-- Six lots of eleven pigs each, all of which were developed on the station farm, were used for this trial.

Lot 1 received rice polish, tankage, and minerals self fed free-choice style for the first period of eight weeks and was fed during the finishing period of 14 weeks on corn, tankage, and minerals self fed free choice.

Lot 2 was fed like lot 1 except that alfalfa hay was added in a rack.

Lot 3 was given a mixture of rice polish 83.5, tankage 9, and alfalfa meal 7.5, mixture and minerals self-fed during the first period, followed by corn, tankage, and minerals during the second period.

Lot 4 received rice polish 79, tankage 6, and alfalfa meal 15, mixture and minerals self fed, and brewers rice, tankage and minerals self fed during the second period.

Lot 5 received brewers rice 83.5, tankage 9, alfalfa meal 7.5, mixture self fed along with minerals during the first period, and the same feeds self fed free choice during the second period.

Lot 6 received white corn chop 83.5, tankage 9, and alfalfa meal 7.5, mixture and minerals self fed during the first period, and yellow

corn, tankage and minerals during the second period.

During the first period and the first two weeks of the second period, all the feeding was in dry lots. During the last 12 weeks all lots were on rye pasture.

A mineral mixture composed of bone meal 50, 16% acid phosphate 25, ground limestone 25, and common salt 5 was kept before the pigs all the time.

The results.-- For the first three weeks it looked as if all lots were going to do quite well, very much better than in previous trials. However, from this point all the lots receiving rice polish began losing ground until during the last two weeks of the first period, all the lots receiving rice polish showed small losses, while lots 5 and 6 receiving brewers rice and corn as the main feeds gave fairly good gains.

In four trials with approximately 250 pigs, rice polish and rice bran have given unsatisfactory results when fed to pigs beginning shortly after weaned. In all these trials except the last the feeding has been the free-choice method.

Tables 1, 2, and 3 give the results in detail.

Table 1: Rice By-products for Hogs, Softening Period,
January 4 to March 1, 1929.

Lot No.	No. pigs in lot	Av. daily gain	Av. initial weight	Av. closing weight	Feed for 100 lbs. gain					
					Rice polish	brewers rice	Corn	Alfalfa	Tankage	Minerals
1	11	.27	52.4	67.5	754.8	---	---	---	72.5	22.9
2	11	.23	57.2	65.3	821.9	---	---	hay 36.0	107.4	29.6
3	11	.10	52.2	57.8	1940.8	---	---	meal 174.2	209.0	65.6
4	11	.21	53.0	64.5	814.9	---	---	meal 154.8	61.9	31.6
5	11	.76	53.3	95.9	---	342.4	---	meal 31.7	38.1	6.2
6	11	.42	55.5	79.1	---	639.9	---	meal 57.5	69.0	12.3

Table 2: Rice By-products for Hogs,
Hardening Period, March 1 to June 7, 1929.

Lot No.	No. pigs in lot	Av. daily gain	Av. initial weight	Av. closing weight	Feed for 100 lbs. gain			
					Brewers rice	Corn	Tankage	Minerals
1	11	1.27	6.75	192.3	-----	353.0	14.0	7.1
2	11	1.38	69.8	205.4	337.3	---	12.3	6.1
3	11	1.40	57.8	194.9	-----	348.7	19.8	5.4
4	11	1.49	64.5	210.7	327.5	---	14.1	6.0
5	11	1.43	95.9	235.6	373.4	---	10.4	5.6
6	11	1.39	79.1	215.3	-----	396.4	16.8	6.0

Table 3: - The Committe Ratings

Lot No.	H	MH	MS	S
1	0	1	5	5
2	6	3	1	1
3	1	4	5	1
4	11	0	0	0
5	11	0	0	0
6	2	1	4	3

Mr. Cobb of the Iberia Station reported as follows on their rice by-products work:

The object of the test was to determine the relative merits of shelled corn and brewers' rice fed to pigs of approximately 75 pounds initial weight, that had been carried for 56 days on softening rations of rice polish and rice bran.

The pigs used consisted of 65 head of the spring litter from the sows on the experiment farm and were all purebred Tamworth in breeding.

The experiment started on August 10.

The pigs were fed as follows:

- Lot 1. Self fed shelled corn, tankage, and mineral mixture 112 days.
- Lot 2. Self fed rice polish, tankage, and min. mix. for 56 days, followed by 56 days on hardening ration of shelled corn, tankage, and mineral mixture, self fed free choice.
- Lot 3. Self fed rice polish, tankage, and min. mix. for 56 days, followed by a hardening ration of brewers' rice, tankage, and mineral mix. self fed free choice for 56 days.
- Lot 4. Self fed rice bran, tankage, and mineral mixture for 56 days followed by a hardening ration of shelled corn, tankage, and mineral mixture for a period of 56 days, self fed free choice.
- Lot 5. Self fed rice bran, tankage, and mineral mixture for 56 days, followed by a hardening ration of brewers' rice, tankage, and mineral mixture for a period of 56 days, self fed, free choice.

The following table gives the feed-lot results of the two periods.-

SUMMARY OF FIRST 56 DAYS FEEDING.

Lot Number.....	1	2	3	4	5
Number of hogs in lot.....	13	13	13	13	13
Number of days fed.....	56	56	56	56	56
Initial wt. per hog.....	71.85	71.	70.77	71.08	71.85
Final wt. per hog.....	118.16	123.92	126.62	115.08	121.46
Total gain per hog during period	46.30	52.92	55.85	44.00	49.61
Average Daily Gain Per Hog.....	.83	.95	1.00	.79	.89
<u>Feed Consumed Per Hog.</u>					
Shelled Corn.....	199.54				
Rice Polish.....		152.92	173.46		
Rice Bran.....				171.77	171.23
Tankage.....	13.54	15.62	17.69	16.54	16.23
Mineral Mixture.....	4.54	4.62	5.31	4.77	4.31
<u>Feed Consumed Per Cwt Gain:</u>					
Shelled Corn.....	430.90				
Rice Polish		288.95	310.61		
Rice Bran.....				390.38	345.12
Tankage.....	29.24	29.51	31.68	37.59	32.71
* Mineral Mixture.....	9.80	8.72	9.50	10.84	8.58

SUMMARY OF SECOND 56 DAYS FEEDING.

Number of lot.....	1	2	3	4	5
Number of hogs in lot.....	13	13	13	13	13
Number of days fed.....	56	56	56	56	56
Initial wt per hog.....	118.15	123.92	126.62	115.08	121.46
Final wt per hog.....	184.15	196	214.69	197.31	206.85
Total Gain Per hog During Period..	66.00	72.08	88.07	82.23	85.39
Average Daily Gain per Hog.....	1.18	1.29	1.57	1.47	1.52
<u>Feed Consumed per Hog:</u>					
Shelled corn.....	280.69	325.38		316.54	
Brewers' Rice.....			361.15		346.15
Tankage.....	18.38	17.00	18.92	20.92	20.08
*Mineral Mixture.....	4.77	5.23	6.69	7.00	5.46
<u>Feed Consumed Per Cwt Gain:</u>					
Shelled Corn.....	425.29	451.44		384.94	
Brewers' Rice.....			410.04		405.41
Tankage.....	27.86	23.59	21.48	25.44	23.51
* Mineral Mixture.....	7.23	7.26	7.60	8.51	6.40

* Mineral mixture made up of the following materials: 10 pounds acid phosphate, 10 pounds wood ashes, and 1 pound salt.

RESULTS OF SLAUGHTER TESTS, FALL, 1928, PIGS.

Pig No.	Age at Slaughter	Av. daily gain During exp.	Committee grading chilled carcasses	Initial weight	Gains, soft feeds	Gains, hard feeds	Total gain	Final weight	Refractive Index Back fat
	Days								
20B	151	Check	MH.						1.4599
80S	100	Check	S	LOT 1					1.4614
1B	265	1.42	H	106	---	---	159	265	
5B	265	1.44	H	93			161	254	
36B	261	1.20	MH	87			134	221	
40B	251	1.04	H	56			117	173	
45B	251	.93	MH	63			104	167	
52S	251	1.00	H	95			112	207	
62S	250	1.13	H	74			127	201	
94S	212	.61	MS	43			68	111	
100B	211	.71	S	43			80	123	
105S	211	.58	MS	41			65	106	
106S	211	.85	MH	32			95	127	
Avg.		.99		67			111	178	
LOT 2.									
2B	265	1.17	H	100	61	70	131	231	
10B	265	1.12	MH	79	61	64	125	204	
31B	261	1.19	MH	83	74	59	133	216	
41B	251	1.12	MH	54	59	67	126	180	
46S	251	1.22	MH	62	61	76	137	199	
53S	251	1.42	H	104	65	94	159	263	
63B	250	1.13	H	67	44	73	127	184	
82B	213	1.03	MH	46	30	85	115	161	
90B	212	.87	MH	29	38	59	97	126	
95S	212	1.23	H	45	56	82	135	183	
114S	206	.71	MS	44	31	49	80	121	
Avg.		1.11		64	53	71	124	188	
LOT 3.									
3B	265	1.56	H	100	69	106	175	275	
16S	265	1.22	H	85	43	94	137	222	
33B	261	1.71	H	115	81	110	191	306	
38S	261	1.51	H	86	69	100	169	255	
39S	261	1.41	H	62	70	88	158	220	
42B	251	1.35	H	77	60	91	151	228	
47S	261	1.32	H	59	60	88	148	207	
54S	251	1.46	H	74	70	93	163	237	
61B	250	1.04	H	71	46	70	116	187	
80B	213	1.20	H	51	47	87	134	185	
91B	212	1.09	H	36	43	79	122	158	
111B	206	.87	H	53	33	65	98	151	
113S	206	.97	H	51	35	74	109	160	
Avg.		1.29		54	43	67	110	214	

RESULTS OF SLAUGHTER TESTS, FALL, 1928, PIGS.

Pig No	Age at slaughter	Av. daily gain during exp.	Committee grading chilled carcasses	Initial weight	Gains soft feeds	Gains hard feeds	Total gain	Final weight	Refractive Index
LOT 4.									
4B	265	1.21	H	114	55	81	136	250	
11B	265	1.01	MS	76	45	68	113	189	
34S	261	1.44	H	86	63	98	161	247	
43B	251	1.06	H	65	37	82	119	184	
48S	251	.95	MH	50	35	71	106	156	
55S	251	1.26	H	86	46	95	141	227	
64B	250	1.21	H	92	47	88	135	227	
66S	250	.79	MH	63	27	62	89	152	
70B	242	1.02	H	63	49	65	114	177	
92B	212	1.17	H	32	36	95	131	163	
102B	211	1.20	H	48	44	90	134	182	
112S	206	.79	H	53	21	68	89	142	
Avg.		1.09		69	42	80	122	191	
LOT 5.									
18S	265	1.35	H	90	66	85	151	241	
14S	265	1.32	H	91	56	92	148	239	
35S	261	1.80	H	103	76	126	202	305	
30XS	261	1.23	H	71	52	86	138	209	
44B	251	1.17	H	58	53	78	131	189	
51B	251	1.29	H	90	51	93	144	234	
60B	250	1.46	H	79	65	98	163	242	
81B	213	.87	H	41	29	68	97	138	
93B	212	1.21	H	39	50	86	136	175	
103B	211	.56	H	34	19	44	63	97	
110B	206	.96	H	51	31	77	108	159	
Avg.		1.20		69	49	84	134	203	

Due to the fact that our litters were badly scattered through the spring we did not follow the assignment so far as the weights of the pigs were concerned, as we were supposed to feed pigs weighing from 30 to 50 pounds. Our older litters had attained too much weight by the time we were able to wean the younger litters for us to hold to the lighter weights. This of course made a very irregular bunch of pigs.

This is a hard factor for us to eliminate with the limited number of sows that we have and to the fact that some of them are very slow breeders.

The results we obtained are in line with previous results.

Reference to table 1 shows that rice bran was approximately equal to corn so far as efficiency of gains was concerned, and rice was slightly better, tho not enough to be very significant.

The figures show a daily gain as follows.-

Lot 1. Corn and Tankage.....	0.83 Pounds.
Lot 2. Rice Polish, Tankage.....	0.95 "
Lot 3. Rice Polish, Tankage.....	1.00 "
Lot 4. Rice Bran, Tankage.....	.79 "
Lot 5. Rice Bran, Tankage.....	.89 "

During the second period of 56 days Brewers' rice showed a consistent and significant gain over the corn fed lots. The average daily gain for the three lots fed corn was 1.31 pounds, while the two lots that were fed brewers rice gained at the rate of 1.54 pounds per day.

These gains are not as good as we have had but reference to the table will show that the feed consumed per cwt gain is not excessive.

Due to a misunderstanding the carcasses were cut up before samples of the fat could be secured and we have only the Committees' report for the quality of the fat on the hogs. This data is given in Table 2, and the work of previous years along the same lines is substantiated. The check lot shows a wider variation than do any of the other lots, as is shown by the fact that we have 1 soft hog, 5 hard hogs, 3 medium soft and 3 medium hard.

It will be noted, however that the hogs in lots 3 and 5, the brewers' rice lots all killed hard.

Mr. Ellis presented the following Summary on Rice
By-Products Experiments:

In the earlier work, pigs with initial weights between (a) 50 and 114 pounds and (b) over 115 pounds were used. Conclusions have been issued covering these experiments. During the past three years experiments have

been conducted at the Arkansas and Iberia Stations on light-weight ^{pigs} averaging approximately 50 pounds at the beginning of the experiment. The summary on 4 rice by-product rations together with check lots on corn and tankage is given in the table.

1. Rice polish and supplements followed by corn and supplements: This group of 31 hogs from 3 experiments shows a wide distribution in gradings. The hogs from the Arkansas Station were generally softer than those from Iberia. In the majority of cases those which were soft or medium soft made poor gains on the rice-polish ration and their final weights were low or else made good gains on rice polish but not as good on corn. The 21 hard or medium-hard hogs were, in the usual case those which gained well during the entire experiment. Further work appears desirable in order to establish a clear-cut conclusion such as is possible in the following group.

2. Rice polish and supplements followed by brewer's rice and supplements:

The 32 hogs in the 3 lots averaged 35.5 pounds on softening feed and 69.7 pounds on hardening feed. All but one were hard or medium hard.

3. Rice bran and supplements followed by corn and supplements: There are 4 lots included in this group. The gradings show 42 out of 49 to be hard or medium hard. The ratio of softening to hardening gain is 1:2.8 with final weights over 150 pounds in the usual case. These results are more uniform than those for the polish-corn group.

4. Rice bran and supplements followed by Brewer's rice and supplements: There were 39 hard hogs in this group. The 5 which were soft or medium soft form approximately 10 per cent of the total.

5. The check lots: Three lots were fed corn and supplements throughout, alongside the rice by-product lots. The gradings and refractive index indicate that the check group averaged firmer than the rice polish-corn group but little different from the other three groups.

6. At both the Arkansas and Iberia Stations additional lots of hogs have been fed combinations of rice-by-products other than those given in the table. When rice bran, rice polish, and corn or brewers' rice are fed together softer hogs are usually produced than when the corn or brewers' rice is used as a hardening feed following the feeding of polish or bran.

Summary of Rice By-Products Experiments

	Checks fed on corn and supplement	Rice polish followed by corn	Rice polish followed by brewers' rice	Rice bran followed by corn	Rice bran followed by brewers' rice
No. lots	3	3	3	4	4
No. hogs	29	31	32	49	47
Initial weight	56	53	51	53	54
Softening period:					
Days		56	56	56	56
Gain		39	36	34	34
Av. daily gain		.70	.64	.61	.64
Hardening period:					
Days	117	61	60	59	59
Gain	141	83	70	94	99
Av. daily gain	1.21	1.41	1.30	1.60	1.57
Final weight	197	180	166	182	189
Grading:					
No. of soft	1	6	0	0	2
No. of medium soft	4	4	1	7	3
" " " hard	6	14	6	15	3
" " " hard	18	7	25	27	39
Average grade	1.6 MH	2.2 MH	1.3 H	.16MH	1.3 H
Refractive index	1.4595	1.4599	1.4594	1.4596	1.4591
Iodine number.					
Thickness	49	35	34	38	40

Peanut Work

Mr. F. R. Edwards reported on results of a peanut hardening experiment conducted at the Georgia Experiment Station.

Corn and Sweet Potato Hardening Test.

(Sept. 6, 1927 to Jan. 10, 1928)

(Slaughtered Jan. 20, 1928)

In this test 27 purebred Poland-China pigs were used. These were all sired by the same boar and were out of sows all of which were of similar blood lines.

Three of the pigs were killed at the beginning of the test and fat samples were taken for refractive-index determinations. The other 24 head were self-fed on peanuts and mineral mixture, free choice, from September 6 to November 1 (56 days). They were then divided into two uniform lots which were self-fed, free choice, on shelled corn 60% digester tankage and mineral mixture to the first lot and on sweet potatoes, 60% digester tankage, and mineral mixture to the second. The mineral mixture used was 75 pounds powdered wood charcoal, 6 pounds salt, 6 pounds marble dust (CaCO_3), 3 pounds flowers of sulphur, 6 pounds Glauber's salt, 3 pounds raw rock phosphate, and 1 pound copperas (iron sulphate). This feeding was continued from November 1 until January 10 (70 days) at which time they were all shipped to Beltsville for slaughter, grading etc. At the time of slaughter the average age was about 10 months.

	Corn hardened	Sweet-potato hardened
Average initial weight	52.2 lbs.	51.1 lbs
" gain on peanuts	46.3 "	45.8 "
" daily gain on peanuts	0.83	0.82
" gain on hardening feeds	108.6	48.7
" daily gain on " "	1.55	0.70
" ratio of softening gain to hardening gain	1:2.34	1.:1.06
" daily gain on both feeds	1.23	0.75
" refractive index number of fat	1.4608	1.4598
" committee grading for hardness	MS	MH
	Hard	6
Detailed committee grading for	Medium Hard	5
hardness:	" soft	5
	soft	2
		1

Mr. Hostetler of the N. C. Agricultural Experiment Station reported on results of cottonseed meal hardening following peanut feeding.

REPORT OF SOFT PORK EXPERIMENT XIX, FOR FISCAL YEAR 1928-1929, by Earl H. Hostetler and J. O. Halverson.

The work this year was planned so as to study the effects of feeding cottonseed meal in the hardening ration. Peanuts were again used as the principal constituent of the softening ration and fed prior to the hardening ration.

The pigs used were divided into two groups according to their initial weights. One group being started at an individual weight of 35 to 40 pounds while in the other group the pigs weighed approximately 35 pounds. A slaughtering weight of 225 pounds was anticipated for all pigs, but in order to reduce the number of shipments to Beltsville some

digression from this optimum weight was necessary. The pigs in the lighter group were changed from softening to hardening feed when they had attained an average weight of about 80 pounds while those in the heavier group were carried to a weight of approximately 100 pounds before being changed to the hardening ration. Each pig, therefore, made a gain of 40 to 45 pounds and 35 to 40 pounds, respectively, in the two groups while on softening feed.

Three pigs from each weight class were fed individually throughout both the softening and hardening periods, the remaining pigs being fed collectively. However, individual weights were recorded at 14-day intervals on all pigs.

In order to gather further information with reference to the condition of pigs that have been finished on corn and cottonseed meal following peanuts, eight additional 65-pound pigs were fed individually as follows:

- (a) 2 pigs, Nos. 13 and 14, received the peanut ration throughout the entire period.
- (b) 2 pigs, Nos. 1 and 2, received the corn and cottonseed meal ration throughout the entire period.
- (c) 4 pigs, Nos. 6, 7, 8, and 9, received the peanut ration until they had attained a weight of approximately 100 pounds and were then given a very limited or starvation ration until they had lost 20 to 25 percent of their total weight. They were then given the corn and cottonseed meal ration until they were ready for slaughter.

The three different rations were compounded from the following amounts of feeds.

Softening or Peanut Ration

Ground peanuts.....	82.7 lbs.
Wheat middlings.....	5.0 "
Fish meal.....	5.0 "
Alfalfa meal.....	5.0 "
Common salt.....	.3 "
Ground limestone.....	1.0 "
Steamed bone meal.....	1.0 "

Total 100.0 "

Hardening or Corn and Cottonseed Meal Ration

Corn meal.....	80.0 lbs.
Cottonseed meal.....	14.0 "
Fish meal.....	5.0 "
Alfalfa meal.....	5.0 "
Common salt.....	.5 "
Ground limestone	1.0 "
Steamed bone meal.....	1.0 "

Total 106.5 "

Starvation Ration

Fish meal.....	5.0 lbs.
Alfalfa meal.....	5.0 "
Wheat middlings.....	10.0 "
Ground limestone.....	.2 "
Common salt.....	.2 "

Total 20.4 "

A summary of the results obtained from the 32 pigs used in the trial are shown in the following tabulation:

Summary of Soft Pork Experiment XIX

Fig No.	Int. wgt.	Change weight	Final wgt.	Gain ratio	Total gain		Aver. Daily gain		Days on feed		Feed consumed		
					Soft	Hard	Soft	Hard	Soft	Hard	Pnts.	Corn	C.S.M.
1	72	-	208	-	-	136	-	1.12	-	121	-	470	82
2	63	-	230	-	-	167	-	1.43	-	117	-	464	81
3	61	96	217	3.42	35	121	.73	1.66	48	73	85	368	64
4	64	96	219	3.84	32	123	.67	1.68	48	73	88	368	64
5	64	94	218	4.13	30	124	.62	1.70	48	73	93	401	70
6	63	100	221	3.27	37	121	.84	1.27	44	95	82	370	65
7	59	97	221	3.26	38	124	.86	1.31	44	95	83	378	66
8	60	91	223	4.26	31	132	.53	1.33	58	99	107	424	74
9	60	95	185	2.57	35	90	.60	.91	58	99	99	329	58
10	39	77	203	3.32	38	126	.84	1.70	45	74	68	371	65
11	38	82	197	2.61	44	115	.98	1.25	45	92	80	392	69
12	40	87	210	2.62	47	123	1.04	1.66	45	74	76	372	65
13	71	-	262	-	191	-	1.58	-	121	-	425	-	-
14	64	-	233	-	169	-	1.44	-	117	-	401	-	-
15	61	102	245	3.49	41	143	.93	2.10	44	68)	Total		
16	59	111	238	3.44	52	127	1.18	1.87	44	68)			
17	47	96	226	2.65	49	130	1.11	1.91	44	68)	810	3197	559
18	62	105	239	3.12	43	134	.98	1.97	44	68)	Average		
19	61	102	238	3.32	41	136	.93	2.00	44	68)	101	300	70
20	61	100	226	3.23	39	126	.89	1.85	44	68)			
21	62	97	217	3.43	35	120	.80	1.76	44	68)			
24	67	81	185	7.43	14	104	.56	1.53	25	68)	400		
25	43	86	239	3.56	43	153	.98	1.70	44	90)	Total		
26	40	90	264	3.48	50	174	1.14	1.93	44	90)			
27	41	69	225	5.57	28	156	.64	1.73	44	90)	659	4648	813
28	36	74	236	4.26	38	162	.86	1.80	44	90)	Average		
32	36	86	251	3.30	50	165	1.14	1.83	44	90)	66	125	81
33	37	76	236	4.10	39	160	.89	1.78	44	90)			
35	52	77	265	7.52	25	188	.83	2.09	30	90)			
36	46	82	243	4.47	36	161	1.20	1.79	30	90)			
37	46	70	234	6.83	24	164	.80	1.82	30	90)			
38	41	66	210	5.76	25	144	.83	1.60	30	90)	465		

The results from this summary are in accord with the two previous years' work with corn and cottonseed meal, 6:1, as a hardening ration. The two groups having average initial weights of 35 pounds and 65 pounds both furnished satisfactory carcasses at good marketable weights, in the different trials covering three years experiments, with one exception. This year pig No. 4 was graded medium soft when according to his initial, change, and final weights and when his rate of gain is considered, there seems to be no reason why he should not have graded as firm as No. 3 and No. 5 which were fed individually in the same series, or as firm as Nos. 15 to 21, inclusive, which were group fed at approximately the same weights as Nos. 3, 4, and 5.

It is interesting to note the satisfactory gains made by the different pigs during the hardening period on a ration containing slightly more than 13 per cent cottonseed meal. In fact, Pigs Nos. 15 to 21, inclusive, consumed on the average 1 pound daily of cottonseed meal for 68 days and made an average daily gain ranging from 1.76 to 2.10 pounds.

The four pigs, Nos. 6, 7, 8, and 9, which were subjected to a starvation period between the softening and hardening feeds were fed individually throughout the experiment.

It was necessary to keep pigs Nos. 6 and 7 in the experiment only 18 days longer than Nos. 3, 4, and 5 in order for them to attain comparable weights in spite of the fact that they were on the starvation ration for 25 days. But on the other hand Pig No. 8 required a total of 157 days, or 36 days longer, to reach this weight. These three pigs, however, were graded hard by the committee on physical grading.

Pig No. 9 in this group, with an initial weight the same as that of Pig No. 8 and with a slightly greater gain on the softening ration, failed to gain normally while on hardening feed and as was anticipated the carcass lacked firmness.

PHYSICAL AND CHEMICAL CARCASS GRADES

Pig No.	Physical		Grade		Refractive Indexes	
	Russell	Hostetler	Hankins	Average		
1	Med. Hard	Med. Hard	Med. Hard	Med. Hard		1.4598
2	Hard	Hard	Hard	Hard		1.4589
3	Med. Soft	Med. Hard	Med. Hard	Med. Hard		1.4598
4	Med. Soft	Med. Soft	Med. Hard	Med. Soft		1.4599
5	Hard	Hard	Hard	Hard		1.4593
6	Hard	Hard	Hard	Hard		1.4596
7	Hard	Hard	Hard	Hard		1.4589
8	Hard	Hard	Hard	Hard		1.4594
9	Med. Soft	Med. Soft	Soft	Med. Soft		1.4606
10	Hard	Hard	Hard	Hard		1.4594
11	Hard	Med. Hard	Med. Hard	Med. Hard		1.4600
12	Hard	Hard	Hard	Hard		1.4592
13	Oily	Oily	Oily	Oily		1.4636
14	Oily	Oily	Oily	Oily		1.4628
15	Med. Hard	Med. Hard	Med. Hard	Med. Hard		1.4594
16	Med. Hard	Med. Hard	Med. Hard	Med. Hard		1.4589
17	Hard	Hard	Hard	Hard		1.4590
18	Hard	Hard	Hard	Hard		1.4590
19	Hard	Hard	Hard	Hard		1.4595
20	Hard	Hard	Hard	Hard		1.4589
21	Hard	Hard	Hard	Hard		1.4590
24	Med. Hard	Hard	Hard	Hard		1.4592
25	Hard	Hard	Hard	Hard		1.4593
26	Hard	Hard	Hard	Hard		1.4591
27	Hard	Hard	Hard	Hard		1.4590
28	Hard	Hard	Hard	Hard		1.4588
32	Hard	Hard	Hard	Hard		1.4594
33	Hard	Hard	Hard	Hard		1.4590
35	Hard	Hard	Hard	Hard		1.4590
36	Hard	Hard	Hard	Hard		1.4590
37	Hard	Hard	Hard	Hard		1.4590
38	Hard	Hard	Hard	Hard		1.4593

Note: Mr. Zeller substituted for Mr. Hankins on committee for Pigs Nos. 6, 7, 10, 12, 25, 26, 27, 28, 32, 33, 35, 36, 37, and 38.

The Peanut Hardening Experiment conducted by the Virginia Agricultural Experiment Station was reported by Mr. Hunt.

Fifteen Duroc-Jersey pigs ranging in weight between 50 and 84 pounds were started on a ration of peanuts and tankage on January 2, 1928. The pigs were self-fed peanuts, tankage, and mineral mixture, free choice, for a period of 56 days.

Following the softening period of 8 weeks, a hardening ration of shelled corn, tankage, and mineral mixture was self-fed. Three lots of 5 hogs each were slaughtered following 8, 12, and 16 weeks, respectively, on hardening feeds.

The mineral mixture fed during both the softening and hardening periods was composed of:

10 parts ground limestone
10 " 16% superphosphate
1 " common salt

The results of this test are summarized as follows:

PEANUT HARDENING EXPERIMENT

	8 weeks on hardening feed, following 8 weeks on soft- ening feed	12 weeks on hardening feed, following 8 weeks on soft- ening feed	16 weeks on hardening feed, following 8 weeks on soft- ening feed
No. of hogs	5	*5	5
Average initial weight	64	75	63
Average peanut gain	76	83	79
Average corn gain	98	152	196
Average final weight	238	311	339
Average daily gain (both periods)	1.55	1.67	1.64
Grade distribution:			
Hard	---	---	---
Medium	2	3	4
Medium soft	3	1	---
Soft	1	---	1
Average refractive index, Back fat	1.4602	1.4600	1.4598

*Gains and final weight of 1 hog do not correspond with killing data.
Averages based on data from 4 hogs.

The following report summarizes the peanut-hardening experiment conducted at the U. S. Animal Husbandry Experiment Farm, Beltsville, Md.

Peanut Feeding at Beltsville, Md., January 30, 1929 to Mar. 20, 1929

An experiment was conducted at the U. S. Animal Husbandry Experiment Farm, Beltsville, Md., in which 50 pigs of fall, 1928, farrow were used. Purebred pigs of the Chester-White, Duroc-Jersey, Poland-China, and Duroc-Jersey-Tamworth crosses were represented in the test.

Three lots of hogs were used in the test, and fed the following feed combinations:

- 20 hogs were self-fed, unshelled peanuts and mineral mixture.
- 20 hogs were self-fed, unshelled peanuts, tankage and mineral mixture.
- 10 hogs (check-lot) were self-fed shelled corn, tankage, and mineral mixture.

The experiment began January 30, 1929 and continued for a period of 7 weeks to March 20, 1929, at which time they were started on the second period of the test and received hardening feeds.

The following table shows the individual weights and gains made by the hogs in the different lots.

Feeding Results During the 7-Week Peanut-Feeding Period, Jan. ³⁰ 1929-Mar. 20, 1929

Kind of Feeds	Mineral Peanuts	Mineral, Peanuts, Tankage	Mineral, Corn, Tankage
No. hogs on test	20	20	10
No. hog days on test	980	980	490
Total initial weight	1476	1478	736
Average " "	73.8	73.9	73.6
Total final weight	2737	2924	1396
Average " "	136.8	146.2	139.6
Total gain	1261	1446	650
Average " "	63.05	72.3	65.0
" daily gain	1.287	1.475	1.326
Total feed consumption	4741	4834	2336
Peanuts	4627	4385	---
Corn	---	---	1820
Tankage	---	427	495
Mineral mixture	114	22	21
Feed consumed per 100 lbs. gn.	375.97	334.30	359.38
Peanuts " " " "	366.93	303.25	---
Corn " " " "	---	---	280.00
Tankage " " " "	---	---	76.15
Mineral mixture " " " "	9.04	1.52	3.23

Feeding Summary of Hardening Period of Hogs Previously Fed Peanuts,

May 20- May 27, 1929

Pad. number	J	H	M	N	I
Previous feeding	Peanuts and minerals	Peanuts and minerals	Check lot, corn, tankage, and minerals	Cornmeal and tankage and minerals	Cornmeal and tankage and minerals
Feeding during hardening period	Cornmeal and tankage	Cornmeal and cottonseed meal	Cornmeal and tankage	Cornmeal and tankage	Cornmeal and cottonseed meal ⁶
No. hogs on test	10	10	10	*10	10
" hog-days on test	585	585	585	570	585
Total initial weight	1362	1375	1366	1461	1453
Average "	136.2	137.5	139.6	146.1	146.3
Total final weight	2612	2449	2572	2496	2530
Average "	261.2	244.9	257.2	249.6	253.0
Total gain	1250	1074	1173	1035	1067
Average gain per hog	125.0	107.4	117.6	103.5	106.7
" daily gain per hog	2.14	1.84	2.01	1.82	1.82
Total feed consumed	4988	4810	5309	4685	4892
Cornmeal	4523	4077	4952	4330	4173
Tankage	455	---	333	320	---
Cottonseed meal	---	680	---	---	696
Feeds consumed per 100 lbs. gain	399.04	447.86	451.45	452.66	458.48
Cornmeal	361.84	379.61	421.09	418.36	591.10
Tankage	34.80	---	28.32	30.92	---
Cottonseed meal	---	63.31	---	---	65.23
Mineral mixture	2.40	4.94	2.04	3.38	2.16

* 1 hog died April 23, 1929.

their Average Committee Grading of Carcass

Par. II

Softening feeds, Peanuts, minerals		Softening feeds, Peanuts, minerals	
Hardening "	Hardening "	Hardening "	Hardening "
Cornmeal, tankage	Cornmeal, tankage	Cornmeal, tankage	Cornmeal, tankage
Hog No.	Hog No.	Hog No.	Hog No.
17.4	56	19.9	65
18.8	59	22.6	72
35.5	58	28.2	74
56	77	51.7	63
87.3	55	102.8	68
89.3	59	118.5	67
97.6	83	118.6	68
118.8	56	121.4	38
122.1	67	122.4	64
122.8	54	133.1	58

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Hog No.	Softening gain	Hardening gain	Softening grade	Hardening grade
18.2	81	124	S	MS
19.2	62	99	H	MF
19.8	89	65	died	MS
51.5	69	93	S	MF
54.9	58	87	MF	S
89.2	75	138	S	MS
102.1	103	111	S	MS
118.10	85	102	MS	H
121.2	45	140	MS	MS
121.8	55	76	S	MF

Phd. M. (Check Lot)

Fed Corn, Tankage and Minerals

Hog No.	Total gain on corn and tankage	Carcass grade
17.2	177	H
18.7	156	H
28.9	141	H
35.3	219	H
54.2	228	MH
87.2	149	H
118.4	191	H
118.9	228	H
121.7	196	H
133.4	141	H

Mr. Ellis presented the following summary of the Effects of Limited vs. Full Feeding of a peanut ration.

In order to determine whether the restriction of the feed allowance of an oily feed to such a point as to allow only slow growth would lessen the quantity of oily fat deposited in the body and thereby lessen the hardening requirements, 2 experiments have been conducted at Beltsville during the last 2 years using peanuts as the oily feed. The peanut ration consisted of ground shelled peanuts with supplements. The hardening ration fed subsequent to the peanut ration consisted of corn and supplements. The make-up of the rations follows;

Softening period.	Experiment I.	Experiment II.
Shelled peanuts.....	70	80
Alfalfa meal.....	5	7
Tankage.....	7	8
Linseed meal.....	3	4
Mineral mixture.....	1	1
Corn.....	14	14

Hardening period.

Experiment I.

Experiment II.

Corn.....	85	85
Tankage.....	9	9
Alfalfa meal.....	5	5
Mineral mixture.....	1	1

Pigs of initial weights ranging from 60 to 80 pounds were used in all tests. A total of 28 pigs were used and individual feed consumption records were kept on the entire number. In each test one lot was fed all they would consume of the peanut ration and another lot was given approximately one-half this amount or enough to produce gains of 0.75 pound per day or less. This figure was exceeded in the first experiment, so the feed was restricted somewhat more in the second one. A third lot was fed approximately a three-quarter feed in the second experiment. Killings of 1 or 2 pigs were usually made in each lot when the softening gain reached 50 pounds. The pigs remaining on test were changed at this point to the corn ration. Further killings were made after gains on the latter ration of 100, 150, and 200 pounds. The feeding results are given in the following table:

Feeding Results on Limited vs. Full Feeding on Softening feed.

	<u>Full feed</u>		<u>Medium</u>	<u>Limited</u>	
	Exp. I	Expt. II	Expt. II	Expt. I	Expt. II
No. pigs.....	4	4	4	8	8
Average initial weight	64	68	80	63	68
" no. days on pea-					
nut ration.....	45	65	48	61	76
Average gain.....	51	62	55	54	54
" daily gain.....	1.14	0.95	1.15	0.89	.72
" " feed.....	3.3	2.9	2.2	1.8	1.4
Feed consumed per 100					
pounds gain.....	2.88	3.03	1.90	2.06	1.96

On Hardening Feed

	<u>Full feed</u>		<u>Medium</u>	<u>Limited</u>	
	Expt. I	Expt. II	Expt. II	Expt. I	Expt. II
No. pigs.....	2	3	4	6	6
Average initial weight	119	130	135	118	122
" no. days on feed	146	114	100	97	94
" gain.....	200	184	131	160	157
" daily gain.....	1.37	1.62	1.30	1.65	1.67
" " feed.....	8.6	7.7	7.07	8.1	6.22
Feed consumed per pound					
gain.....	6.3	4.77	5.44	4.94	3.71

The most striking results of this experiment are the low feed consumption per pound of gain secured on the lot fed on the limited as well as on the medium basis. In the two lots on limited feeding, 16 pigs gained at the rate of 1 pound for each 2.01 pound of feed consumed. Compared to the full-fed pigs, they required only two thirds as much feed for equal gains. In the hardening period (all full-fed) there were differences between the various lots but on the whole the limited fed pigs gained better and required less feed than the full or medium fed lots.

The results on carcass grading and chemical analysis of the fat, both fat percentage and fat constants are given in the table.

Grading and Chemical Data on Limited Fed Hogs

	<u>Full feeding</u>		<u>Medium</u>	<u>Limited feeding</u>	
	Exp. I	Exp. II	Exp. II	Exp. I	Exp. II
Off. softening period after 50 pounds gain:					
No. hogs	2	1	-	2	2
Grading	0	0	-	0	0
Refractive index	1.4623	1.4626	-	1.4626	1.4638
Iodine no.		82.6	-		93.8
Fat content - percent	27.3	31.5	-	27.4	28.7
Thickness fat - m.m.	19		-	20	25
Off. hardening period after 100 pounds gain (2X):					
No. hogs	-	-	2	2	2
Grading			MH-H	MS	H
Refractive index			1.4598	1.4605	1.4599
Iodine no.			62.5	70.8	64.5
Fat content -- per cent			-	27.8	37.2
Thickness fat -- m.m.			49	41	39
Off. hardening after 150 pounds gain (3X):					
No. hogs		2	2	2	2
Grading		H	MH-H	MH	H
Refractive index		1.4597	1.4595		1.4594
Iodine no.		63.0	63.2		60.0
Fat content - per cent		----	----	42.9	48.3
Thickness fat - m.m.		52	47	43	56
Off. hardening after 200 pounds gain (4X):					
No. hogs	2	1	----	2	2
Grading	MH	H	----	MH-H	MH
Refractive index	1.4595	1.4595	----	1.4595	1.4600
Iodine no.	64.2	59.7	----	61.9	62.2
Fat content - per cent	51.7	45.7	----	46.7	45.3
Thickness fat - m.m.	54	57	----	54	50

Apparently, the restricted feeding did not cause an appreciable drop in the rate of fat storage. The fat content of these pigs is comparable to that obtained on a brewer's rice ration in a previous experiment.

All results on the hogs which were fed the hardening ration are not as uniform and consistent as might be expected. The small number of hogs make comparisons difficult. However, hogs which had made gains on hardening feed 3 times that on softening were entirely satisfactory from the standpoint of firmness. The fat content of the animal appears to be closely related to the firmness of the carcass. Thus in the limited fed hogs which were analyzed after 100 pounds of hardening gain, the 2 "MS" hogs had a fat content of 27.7^{per cent} and the 2 "H" hogs showed a content of 37.2^{per cent}.

Generally speaking, the results are not conclusive as to differences, if any, in hardening requirements. However, they do indicate the possibilities of securing harder hogs for the same gain in weight as well as more economical feed utilization when the softening feed is limited as compared to full feeding.

Mr. Hankins presented the following summary tabulation of results of hardening peanut-fed pigs on corn and tankage.

SUMMARY OF RESULTS OF HARDENING PEANUT-FED PIGS ON CORN AND TANKAGE.
(Range of initial weight, 50-84 pounds)
(Peanut gains 20-50 pounds)

Range of gain on hardening ration	No. pigs	Grade	R. I.	Initial weight	Gain (Pnts)(C.&T.)	Final weight
0-25	1	SO	1.4618	51	35	120
26-50	6	S	1.4614	"	"	133
51-75	2	MS	1.4609	"	"	139
76-100	10	MS	1.4603	"	"	187
101-125	17	MS	1.4603	"	"	207
126-150	12	MH	1.4599	"	"	229
151-175	6	MS	1.4600	"	"	256
176-200	6	MS	1.4599	"	"	291
201-225	3	MH	1.4594	"	"	306
226-250	3	MH	1.4596	"	"	355
	66					

SUMMARY OF RESULTS OF HARDENING PEANUT-FED PIGS ON CORN AND TANKAGE
(Range of Initial weights 50-84 pounds)
(Peanut gains over 50 pounds)

Range of gain on hardening ration	No. pigs	Grade	R. I.	Initial weight	Gain (Pnts)(C&T)	Final weight
26-50	2	S	1.4606	69	44	178
51-75	1	S	1.4610	"	"	185
76-100	8	S	1.4605	"	"	220
101-125	6	MS	1.4602	"	"	243
126-150	15	S	1.4603	"	"	273
151-175	13	MS	1.4601	"	"	297
176-200	8	MS	1.4600	"	"	323
201-225	9	MS	1.4597	"	"	342
	82					

Cull Navy Bean Work

The following report was prepared by Mr. W. E. J. Edwards of the Michigan Agricultural Experiment Station, who was unable to be present at the conference.

Cull navy beans were fed in different proportions with corn in two experiments conducted at the Michigan Station during the winters of 1926 and 1927. In these experiments rapidity of gains had a closer relation to the hardness of pork produced, than had the proportions of cull beans in the ration. In the 1927 experiment the pigs that gained 1.1 pounds or more per day produced hard, or medium hard carcasses in nearly every case, and the pigs that gained less than 1.1 pounds daily produced soft or medium soft carcasses in all but two cases. The improvement of the ration, so that fairly rapid gains would result, seemed therefore to be one of the more important problems involved in the soft pork studies.

In the experiment reported at this time tankage was added to the rations of two lots of pigs fed cull beans as the major part of their rations.

As the protein of beans has a low biologic value, it was thought that the addition of tankage would improve the quality of the protein in the ration and thereby produce considerably more rapid gains, which, according to our previous studies, should result in a larger proportion of hard carcasses.

The experiment was started February 17, 1928 when the pigs averaged slightly over 100 pounds in weight, and was terminated for the respective lots when the pigs averaged approximately 200 pounds.

Feeds Used and Methods of Feeding.

Lot 1. Ground corn and tankage, self-fed, free choice.

Lot 2. Cull navy beans two parts and ground corn one part, trough-fed.

Lot 3. Cull navy beans two parts and ground corn one part, trough-fed, tankage self-fed.

Lot 4. Cull navy beans two parts and ground barley one part, trough-fed.

Lot 5. Cull navy beans two parts and ground barley one part, trough-fed, tankage self-fed.

Lot 6. Cull navy beans two parts and ground oats one part, trough-fed. Yellow corn and ^{per cent} 60/tankage were used.

Each group of pigs had access to a mineral mixture in a self-feeder and alfalfa hay in a rack.

The mineral mixture used was composed of 45 pounds feeding bone meal, 20 pounds pulverized limestone and 30 pounds common salt.

The cull navy beans were boiled until they were fairly soft and were then mixed, while hot, with the ground grain for the respective lots.

Analysis of feeds

Feed	Moisture	Ether Extract	Crude fiber	Protein
Oats.....	11.72	5.00	11.50	9.56
Barley.....	12.48	2.00	4.75	10.92
Corn.....	15.59	3.00	2.10	9.00
Cull navy beans.....	15.13	1.45	3.95	22.80
Tankage.....	7.14	7.47	0.39	57.20

Table 1 gives the details of the feeding part of the experiment.

Table 1.- Results of Cull Bean Feeding Experiment - 1928

	Lot 1		Lot 2		Lot 3		Lot 4		Lot 5		Lot 6	
	Ground corn	Cull beans	Ground corn	Cull beans	Ground corn	Cull beans	Ground corn	Cull beans	Ground corn	Cull beans	Ground corn	Cull beans
8 pigs in lot												
	tankage	2 pts.	gr. corn 1 pt.	2 pts.	gr. corn 1 pt.	2 pts.	gr. corn 1 pt.	2 pts.	gr. corn 1 pt.	2 pts.	gr. corn 1 pt.	2 pts.
	minerals	gr. corn 1 pt.	trough fed	gr. corn 1 pt.	trough fed	gr. corn 1 pt.	trough fed	gr. corn 1 pt.	trough fed	gr. corn 1 pt.	trough fed	gr. corn 1 pt.
	alf. hay	minerals	tankage	minerals	tankage	minerals	tankage	minerals	tankage	minerals	tankage	minerals
	self-fed	alf. hay	alf. hay	alf. hay	alf. hay	alf. hay	alf. hay	alf. hay	alf. hay	alf. hay	alf. hay	alf. hay
		self-fed	self-fed	self-fed	self-fed	self-fed	self-fed	self-fed	self-fed	self-fed	self-fed	self-fed
	Feb. 17 to	Feb. 17 to	Feb. 17 to	Feb. 17 to	Feb. 17 to	Feb. 17 to	Feb. 17 to	Feb. 17 to	Feb. 17 to	Feb. 17 to	Feb. 17 to	Feb. 17 to
	Apr. 12	May 11	Apr. 28	May 13	Apr. 28	May 13	Apr. 28	May 13	Apr. 28	May 13	Apr. 28	May 13
Av. initial weight (lbs.)	106.87	109.12	106.25	108.00	106.25	108.00	106.25	108.00	106.25	108.00	106.25	108.00
Av. final weight "	201.00	201.37	202.12	195.37	202.12	195.37	202.12	195.37	202.12	195.37	202.12	195.37
Av. daily gain per pig (lbs.)	1.711	1.098	1.350	1.007	1.350	1.007	1.350	1.007	1.350	1.007	1.350	1.007
Days to reach approx. 200 "	54	83	69	90	69	90	69	90	69	90	69	90
Av. daily feed consumed:												
Cull navy beans		3.479	3.498	5.209	3.498	5.209	3.498	5.209	3.498	5.209	3.498	5.209
Ground corn	5.986	1.863	1.886	1.718	1.886	1.718	1.886	1.718	1.886	1.718	1.886	1.718
Ground barley												
Ground oats												
Tankage	.543		.204		.204		.204		.204		.204	
Minerals	.005	.016	.012	.012	.012	.012	.012	.012	.012	.012	.012	.012
Alfalfa hay	.268	.088	.088	.087	.088	.087	.088	.087	.088	.087	.088	.087
Total minus alf. hay	6.534	5.358	5.600	4.939	5.600	4.939	5.600	4.939	5.600	4.939	5.600	4.939
Feed required for 100# gain:												
Cull navy beans		316.80	259.06	318.60	259.06	318.60	259.06	318.60	259.06	318.60	259.06	318.60
Ground corn	349.80	169.65	139.64	170.57	139.64	170.57	139.64	170.57	139.64	170.57	139.64	170.57
Ground barley												
Ground oats												
Tankage	31.74		15.12		15.12		15.12		15.12		15.12	
Minerals	.265	1.490	.912	1.171	.912	1.171	.912	1.171	.912	1.171	.912	1.171
Alfalfa hay	15.67	7.39	6.52	8.64	6.52	8.64	6.52	8.64	6.52	8.64	6.52	8.64
Total minus alf. hay	381.80	487.94	414.73	490.34	414.73	490.34	414.73	490.34	414.73	490.34	414.73	490.34
Feed cost for 100# gain:												
Cull Navy beans @ \$25.00 ton		\$3.96	\$3.24	\$3.98	\$3.24	\$3.98	\$3.24	\$3.98	\$3.24	\$3.98	\$3.24	\$3.98
Ground corn @ 1.75 cwt.	\$6.12	2.97	2.44	2.99	2.44	2.99	2.44	2.99	2.44	2.99	2.44	2.99
Ground barley @ 1.75 "												
Ground oats @ 1.75 "												
Tankage @ 75.00 ton	1.19		.57		.57		.57		.57		.57	
Minerals @ 30.00 ton	.01	.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.02
Alfalfa hay @ 12.00 ton	.09	.05	.04	.05	.04	.05	.04	.05	.04	.05	.04	.05
Total	7.41	7.00	6.30	7.04	6.30	7.04	6.30	7.04	6.30	7.04	6.30	7.04

Brief Discussion of Table I

Ground corn and tankage produced much more rapid daily gains and required considerably less feed for 100 pounds of gain than did any of the other feed combinations used. The high cost of corn and tankage, however, made the gains from these two feeds the most expensive.

The addition of tankage to cull navy beans and corn, or to cull navy beans and barley, increased the average daily gains approximately one-quarter pound in each case.

Cull navy beans when fed with ground corn, ground barley, or ground oats, produced practically the same daily gains.

Table 2. - Grading of Carcasses

Lot	Av. Daily Gain	Committee grading chilled carcasses					Refractive index. Av. for lot.
		Hard	Med.	Med.	Soft	Soft	
1	1.711	3	4	1			1.4599
2	1.098	1	1	3		3	1.4602
3	1.350	1	5	1		1	1.4602
4	1.007	1	4			2	1.4601
5	1.255		5	1		2	1.4601
6	1.106			3		5	1.4607

Discussion of Carcass Grading

Corn and tankage (Lot 1) produced considerably firmer carcasses than any of the other feed combinations.

Barley and cull beans (Lot 4) made slightly firmer carcasses than corn and cull beans (Lot 2).

Oats and cull beans produced much softer carcasses than any of the other feed combinations used.

As indicated by the refractive index, the addition of tankage to either corn and cull beans, or barley and cull beans, had no influence on the hardness of the carcasses produced in this experiment.

Although there is no definite relation in the different lots between the rapidity of gains and the hardness of the carcasses, except in the case of Lot 1, in the main the pigs making the most rapid gains produced hard, or medium hard carcasses, where as the slow gaining pigs dressed soft carcasses.

Cowpea Feeding Work

The following report was prepared by Mr. Greene of the Coastal Plain Experiment Station, McNeill, Miss.

SOFT PORK EXPERIMENT, 1928

The object of the experiment in the fall of 1928 was to determine the palatability of cowpeas, their feeding value and their effect on the degree of hardness of the carcass when fed to hogs in combination with corn and with corn and tankage.

The variety of Cowpeas

The experiment was planned to duplicate the experiment of 1927 with the Six-Week variety of cowpea. However, due to a crop failure of the late crop of this variety, both on the experiment station and throughout the section in which they are grown, this variety was not available for the self-fed lot and it was necessary to feed dry, mixed peas carried over from the crop of 1927. The Six-Week Pea planted adjacent to the corn for the grazing lots might have carried these lots had not a deer grazed them heavily before he was discovered and shot. After the first two weeks the grazing lots had some dry peas supplied in addition to the grazing, and after four weeks they were self-fed dry peas from the same batch as was fed to the dry lot. Following is the analysis of the peas fed:

Water	10.13	Crude protein	27.61
Ash	3.39	Fat	1.26

The Hogs:

The hogs were all purebred Tamworths from the spring litters raised on the experiment station farm. From weaning to the start of the experiment they had been fed corn and tankage on carpet-grass pasture. There had been an outbreak of cholera in the herd before vaccination, but the pigs used in the experiment had never been unthrifty. The 3 cowpea lots started at weights of approximately 110 pounds and the check lot at 119 pounds.

The 3 check pigs shipped to Beltsville, Md., for slaughter at the beginning of the experiment weighed 112, 98 and 98 pounds. The carcass grading of each was medium soft.

Lot 1-Check Lot--Fed Shelled White Corn, Marine Tankage and Mineral Mixture Self-Fed, Free Choice. Nov. 8, 1928 to Jan. 16, 1929. 70 days

This lot was self-fed in a half-acre lot which had some Bermuda grass grazing.

The initial weight was 119 pounds. The final weight was 243 pounds. The total gain 124 pounds. The average daily gain 1.78 pounds.

The feed consumed for each 100 pounds gain was: Corn 358.3 pounds, tankage 51.1 pounds, and mineral mixture 4.3 pounds.

Two hogs killed medium hard, 1 killed medium soft, and 5 killed soft. No reason was apparent for this variation from the usual carcass grading of hogs fed corn and tankage.

Lot 2--Shelled White Corn, Shelled Dry Cowpeas of Mixed Variety and Mineral Mixture, Self-Fed, Free Choice. Nov. 8, to Jan. 16, 1929. 70 days

This lot was fed in a lot adjacent to the check lot and entirely similar.

The initial weight was 109 pounds. The final weight 161 pounds. The total gain 52 pounds. The average daily gain per head was 0.73 pound.

The feed consumed for each 100 pounds gain was: Corn 501.3 pounds, dry shelled cowpeas 84 pounds, and mineral mixture 13.3 pounds.

The peas were unpalatable and this apparently affected the palatability of the corn as the 10 head of pigs in this lot ate a thousand pounds less corn than the 8 head in the check lot. The gains were slow and not economical. The consumption of mineral mixture was more than twice as much as any of the other lots.

Two sows were retained from this lot for breeding purposes and 8 head slaughtered. All graded soft. This is not in accord with a similar lot of the previous year fed shelled Six-Week Cowpeas, 8 of which killed hard, 1 medium hard, and 1 medium soft.

Lot 3 - Corn and Cowpeas Grazed; Tankage and Mineral Self-Fed. Nov. 8, 1928 to Jan. 16, 1929. 70 Days

This lot of 10 head grazed white corn of the same variety fed to the 2 self-fed lots. They had grazing of Six-Week Cowpeas part of the time, but were fed dry peas of the same variety as fed in the self-fed lot after the first 2 weeks. At the end of 4 weeks the cowpea grazing was exhausted. Marine tankage was self-fed for the full period.

The initial weight was 108 pounds. The final weight 214 pounds. The total gain 106 pounds. The average daily gain 1.5 pounds.

The feeds consumed for each 100 pounds gain were: Corn and cowpeas no estimate, tankage 37.3 pounds, and mineral mixture 5.0 pounds.

The 9 hogs from this lot shipped to Beltsville graded, 1 medium hard, 5 medium soft, and 3 soft. A lot receiving tankage with corn and Six-Week cowpeas grazed the previous year all killed out exceptionally hard, after making about the same average daily gain as this lot.

Lot 4 - Corn and Cowpeas Grazed and Mineral Mixture Self-Fed. Nov. 8, 1928, to Jan. 16, 1929. 70 days.

This lot of 10 head grazed corn and cowpeas in an adjacent part of the same field as Lot 3 above. The feeding and conditions were the same except that this lot did not receive tankage.

The initial weight was 111 pounds. The final weight 198 pounds. The total gain 87 pounds. The average daily gain 1.23 pounds.

The mineral mixture consumed was 6.3 pounds for each 100 pounds gain. No estimate was made of the corn and cowpeas consumed.

One carcass from this lot graded medium soft and 9 graded soft. From a lot of the previous year grazing corn and Six-Week cowpeas, 8 killed out hard and 2 medium hard.

The results of the carcass gradings from these lots are at conflict with the carcass gradings of the previous year with the variety and quality of cowpeas being the only apparent variable. What is even more confusing is the fact that the check lot fed corn and tankage killed out soft after having made an average daily gain of 1.78 pounds over a period of 70 days. The same plan is to be repeated in 1929, using the Six-Week cowpea again.

The following table gives a summary for the four lots.

Summary Table

Cowpeas in Combination with Corn and Tankage - Check Lot Corn and Tankage,
November 8, 1928 to January 15, 1929

	Lot 1 Corn, Tankage, Mineral- self-fed	Lot 2 Corn, Shelled cowpeas Mineral- self-fed	Lot 3 Corn Cowpeas grazed Tankage, Mineral- self-fed	Lot 4 Corn Cowpeas grazed, Mineral- self-fed
Number of hogs	8	10	10	10
Ave. initial weight	119	109	108	111
Ave. final weight	243	161	214	198
Ave. total gain	124	52	106	87
Ave. daily gain	1.78	.73	1.5	1.23
Total Feeds Consumed:				
Corn	3576	2582	Grazed	Grazed
Tankage	510		395	
Cowpeas		433	Grazed	Grazed
Mineral	43	69	53	55
Feeds per 100 pounds gain:				
Corn	358.3	501.3	---	---
Tankage	51.1	---	37.3	---
Cowpeas	---	84	---	---
Mineral	4.3	13.3	5.0	6.3
Proportion of Cowpeas to Corn:		1:5.9		
Carcass Gradings:				
Hard	---	---	---	---
Medium hard	2	---	1	---
Medium soft	1	---	5	1
Soft	5	8	3	9

Two pigs from Lot 2 and one from Lot 3 were retained for breeding.

Lots 3 and 4 were fed dry peas in addition to the grazing after the first four weeks.

The dry peas fed were from the crop of 1927 and were somewhat weevil-eaten. They were of the variety commonly known as Clay Mixed.

Inheritance Work

Mr. Martin prepared the following report on the Effect of Feeding of Dam on Quality of Pork Produced.

University of Arkansas.

Purpose.-- Previous trials had shown that the softening feeds fed during the development of the gilts and through the gestation periods to farrowing time had no effect on the quality of pork produced by the offspring. The last trial was arranged to find if the feeding on softening feed could be continued through the suckling period and for sometime after without adding materially to the softness of the pork produced by the pigs.

Procedure.-- Eleven Poland China pigs were hand fed a mixture of rice polish 60, rice bran 30, and tankage 10. Also creamery buttermilk was fed as available. The minerals were supplied by a mixture of 50 parts bone meal, 25 parts 16% acid phosphate, 25 ground limestone, and 5 of common salt, mixture self fed.

Nine of the 11 Poland China gilts settled and farrowed litters by a Tamworth boar. Six of the sows and their litters were carried on the rice polish-rice bran mixture through to weaning time and 3 for 4 weeks after weaning time. For 3 of the sows and litters, the change from the softening feeds occurred at farrowing time. All 3 groups were fed corn, shorts, tankage, and mineral mixture after discontinuing the softening feed.

Lot 1 was changed to the hardening ration when the pigs were farrowed.

Lot 2 was changed to the hardening ration when the pigs were weaned at 8 weeks of age.

Lot 3 was changed to the hardening ration 4 weeks after weaning the pigs.

The results.-- 15 hogs were sent to market from lot 1. These killed 4H, 7MH, and 4MS, with an average refractive index of 1.4596.

From lot 2, 17 hogs were sent to market which killed 4H, 4MH, 6MS, and 3S, with 1.4598 for the average refractive index.

From lot 3, 20 hogs were sent to market which killed 7H, 8MH, 4MS, and 1S, with an average refractive index of 1.4597.

The results show, that as firm pork can be produced by feeding rice polish and rice bran to weaning time and for 2 to 4 weeks thereafter, as by feeding this softening feed only until farrowing and then changing to hardening feeds.

Mr. Zeller reported on results of the Inheritance test conducted at Beltsville, Md. on pigs from peanut-fed and brewer's-Rice fed dams.

Inheritance Test - Soft-Pork Investigations, Beltsville, Md.

Five Chester White pigs and 4 Duroc Jersey pigs of Spring 1928 farrow, from two sows fed peanuts 5 parts, cornmeal 3 parts, tankage 1 part during the gestation period were started on test May 22, 1928.

These pigs were self-fed shelled corn, middlings, tankage, and mineral mixture from the time they began to eat until they were slaughtered.

The following table shows the weights of the pigs at the start and close of the test together with their official carcass grades at slaughter.

Pig No.	Wt. on test	Wt. off test	Gain	Hog days on test	Official carcass grade
	5/22	10/10			
14.1	44	194	150	141	H
14.2	49	228	179	141	H
14.4	43	219	176	141	H
14.5	46	199	153	141	1H
14.6	40	209	169	141	H
	6/15				
41.1	38	232*	194	147	Ms
41.2	33	165+	132	202	S
41.3	24	234+	210	202	H
41.5	32	198*	166	147	S
	349	1878	1529	1403	(MH) (2.0)

* Pigs 41.1 and 41.5 were taken off test 11/9/28

+ Pigs 41.2 and 41.3 " " " " 1/3/29

The following table shows feeding results of the pigs from May 22, 1928 to January 3, 1929.

No. hogs on test.....	9
No. hog days on test.....	1403
Total initial weight.....	349
Average " "	38.78
Total final weight	1878
Ave. " "	208.67
Total gain.....	1529
Average gain.....	169.89
Average daily gain per pig.....	1.09

Total feed consumed	5690
Corn.....	4560
Middlings	720
Tankage	380
Mineral	30
Feed consumed per 100 lbs. gain	405.56
Corn	325.02
Middlings	51.32
Tankage	27.08
Mineral	2.14

The mineral mixture was composed of:

50 parts	steamed bonemeal
25 "	16% superphosphate
25 "	ground limestone
5 "	common salt

Inheritance Test, Soft-Pork Investigations, Beltsville, Md.

October 22, 1928 - March 27, 1929

Two Poland-China pigs of fall 1928 farrow, from a sow fed Brewers' rice, middlings, tankage, and alfalfa meal during the gestation period were started on test October 22, 1928.

The pigs were self-fed shelled corn, middlings tankage, and mineral mixture from the time they were weaned until they were slaughtered. During the suckling period they received shelled corn and tankage.

The following table shows the weights of the pigs at the start and close of the test together with their official carcass grade at slaughter.

	<u>Wt. Oct 22</u>	<u>Wt. off Mar. 27</u>	<u>Gain</u>	<u>Carcass grade</u>
99.1	57	212	155	H
99.3	52	208	156	H

The following table shows feeding results of the pigs from Oct. 22, 1928-Mar. 27, 1929

No. hogs on test	2
No. hog days on test	312
Total initial weight	109
Average " "	54.5
Total final weight	420
Average " "	210
Total gain	311
Average gain	155.5
" daily gain	1.00
Total feed consumed	1276
Corn	883
Middlings	219
Tankage	162
Mineral mixture	12
Feed consumed per 100 lbs. gain	410.29
Corn	285.92
Middlings	70.42
Tankage	52.09
Mineral mixture	3.86

Breeding and Alfalfa Pasture vs. Dry Lot Work

Mr. Hughes prepared the following report on alfalfa pasture vs. Dry lot work at the California Agricultural Experiment Station.

On June 16, 1928, 80 spring pigs were weighed and divided into two lots as uniformly as possible. Each lot consisted of 20 purebred Poland Chinas and 20 purebred Duroc Jerseys.

In order to obtain a variation in bloodlines, 4 Poland China and 4 Duroc Jersey bred sows were purchased from three different farms in California. Some of the pigs from each of these sows were used in both lots.

The pigs in Lot I were placed on ¹¹/₂ acres of alfalfa pasture and were fed rolled barley and skim milk in the ratio of 1 pound of barley to 3 pounds of skim milk, hand-fed twice daily. Lot II was placed in dry lot and fed rolled barley and skim milk in the ratio of 1 pound of barley to 3 pounds of skim milk, hand-fed twice daily.

The experiment was concluded on November 3, 1928. The hogs were slaughtered on November 5 and the carcasses were graded by Dr. G. H. Hart, Mr. E. Z. Russell, and Glenmore Imbach.

Fat samples were taken and placed in cold storage until January, when they were rendered. A two-ounce sample of the rendered fat from each individual was sent to Mr. Ellis for further study.

Summary of Results of the Feeding Trial

Lot No.	No. of pigs	Average initial weight	Average final weight	Average daily gain	Ration	Feed consumed per 100 pounds gain
		lbs.	lbs.	lbs.		lbs.
I.	*19 D.J.	46.35	186.74	1.003	Rolled barley 1 part	278.77 barley
	**19 P.C.	39.72	171.58	.942	Skim milk 3 parts	836.31 skim milk
	Average	43.03	179.16	.973	Alfalfa pasture	
II.	18 D.J.	45.00	194.00	1.064	Rolled barley 1 part	262.44 barley
	20 P.C.	35.95	180.00	1.031	Skim milk 3 parts	787.32 skim milk
	Average	40.23	186.79	1.047		

*D. J. 118 removed from experiment 8/25/28 (pneumonia)

**P. C. 20 died 7/14/28

D. J. 96 and 105 died 7/17/28.

DAVIS, CALIFORNIA

Comparison of Durocs and Folangs

	Spring 1926	Fall 1926	Spring 1927	Spring 1928	Total	Spring 1926	Spring 1927	Spring 1928	Total	Spring 1926	Spring 1927	Spring 1928	Total
Number of hogs.....	14	10	20	37	81	17	19	20	39	95			
No. days on test.....	167	154	154	140	12138 **	167	154	154	140	14305 **			
Total initial weight.....	749	545	1060	1691	4045	804	890	980	1472	4146			
Av. " ".....	53.52	54.5	53.0	45.7	49.9	47.31	46.84	49.0	37.7	43.6			
Total final weight.....	2944	2042	4010	7040	16036	3362	3914	3944	5866	18086			
Av. " ".....	210.28	204.2	200.5	190.3	198.0	197.76	206.0	197.2	176.1	190.4			
Total gain.....	2195	1497	2950	5349	11991	2558	3024	2964	5394	13540			
Av. gain per pig.....	176.76	149.7	147.5	144.6	148.1	150.45	159.16	148.2	138.3	146.8			
Av. daily gain.....	.944	.972	.958	1.03	.988	.908	1.03	.962	.988	.974			
Ave. R. I.	1,4594	1,4582	1,4582	1,4585	1,4585	1,4594	1,4587	1,4591	1,4590	1,4590			
Carcass grading.....	12 h	8h	17 h	31 h	69 h	5 h	3 h	5 h	5 h	18 h			
	2 mh	2 mh	3 mh	3 mh	10 mh	6 mh	6 mh	8 mh	15 mh	35 mh			
				2 ms	2 ms	5 ms	8 ms	6 ms	9 ms	28 ms			
				1 s	1 s	1 s	2 s	1 s	10 s	14 s			
Percent carcass grading	85.71h	80.0 h	85.0 h	83.78 h	83.95 h	29.41 h	15.79 h	25.0 h	12.82 h	18.95 h			
	14.29mh	20.0mh	15.0 mh	18.11 mh	12.35 mh	35.29mh	31.58 mh	40.0 mh	38.46mh	36.84mh			
				5.41 ms	2.47 ms	29.41ms	42.11ms	30.0ms	23.08ms	29.47ms			
				2.70s.	1.23 s	5.89s	10.52 s	5.0 s	25.64 s	14.74 s			

* 10 hogs in this lot were from Stralock farm, of a different breeding than the University farm, but graded practically the same, with exactly the same refractive index.

** Hog days

Velvet Bean Work

Mr. F. R. Edwards presented the following report on Velvet Bean Feeding Tests conducted at the Georgia Agricultural Experiment Station.

Five lots of 10 pigs each were used in this feeding test. Check pigs were killed and samples taken for refractive-index determination at the beginning of the experiment. The lots were fed as follows:

- Lot I. Shelled corn, 60% digester tankage, and mineral mixture, (self-fed, free choice).
- Lot II. Mixture of shelled corn and shelled velvet beans (50% each, ground together), 60% digester tankage, and mineral mixture (self-fed, free choice).
- Lot III. Shelled velvet beans, 60% digester tankage, and mineral mixture (self-fed, free choice).
- Lot IV. Shelled velvet beans and mineral mixture (self-fed, free choice).
- Lot V. Cooked shelled velvet beans and mineral mixture (self-fed, free choice).

Feeding was carried on as above from February 28 to July 24 (147 days) when the animals were shipped to Washington for slaughter, grading, etc. Signs of vomiting and of diarrhea were observed in Lots III and IV for about two days after the start of the feeding, but this then disappeared. At this time there was an unusually heavy consumption of the beans. Overeating and indigestion and a toxic property in the beans are possible explanations of this. The animals in Lot IV seemed to do poorly throughout the test and two of their number did especially badly and had to be removed from the experiment. There was a lack of thrift apparent in Lot IV. Of lots III, IV, and V, not receiving corn, the animals in Lot V were decidedly most thrifty. Lot III consumed a very large amount of tankage, apparently using it as a carbohydrate feed. The mineral mixture consumption was heavy in the velvet-bean lots.

The following data are submitted:

	Lot I	Lot II	Lot III	Lot IV	Lot V
Average starting weight	95.7	94.5	97.0	93.8	95.8
Average finishing weight	310.1	276.4	185.6	149.5	216.4
Average daily gain per animal	1.46	1.24	0.60	0.38	0.82
Average committee grading	H	MS	S	S	S
Detailed " " H	10	...	...	...	...
MH	...	2	...	...	...
MS	...	4	...	...	3
S	...	4	10	8	7
Average feed cost per 100# gain	\$8.40	\$9.99	\$15.49	\$9.44	\$8.41

Dressing Percentage Study

Mr. Hankins presented the following summary of study of dressing percentages based on final weight.

STUDY OF DRESSING PERCENTAGES

(5219 hogs)

Range of final weight	Hard	Medium hard	Medium soft	Soft	Soft and oily
40-59	-	-	-	(8) 65.29	-
60-79	-	-	-	(17) 66.64	-
70-89	(3) 67.16	-	(9) 70.43	-	(8) 67.56
80-99	-	-	-	(46) 67.13	-
100-119	(5) 71.66	(2) 70.10	(32) 70.90	(64) 69.45	(7) 72.51
120-139	(8) 73.67	(26) 75.91	(38) 75.13	(81) 71.84	(29) 71.72
140-159	(23) 74.57	(51) 75.81	(78) 74.21	(133) 73.86	(48) 74.53
160-179	(88) 76.91	(104) 76.97	(164) 75.91	(200) 75.04	(31) 74.81
180-199	(201) 77.03	(164) 76.35	(213) 75.75	(211) 75.29	(51) 75.47
200-219	(318) 77.87	(246) 76.92	(227) 76.36	(175) 76.76	(40) 78.63
220-239	(319) 77.79	(180) 77.33	(152) 76.87	(124) 76.64	(26) 77.12
240-259	(216) 77.76	(112) 77.66	(84) 77.25	(67) 76.80	(5) 78.07
260-279	(130) 78.52	(82) 77.66	(57) 76.98	(40) 76.71	(10) 79.12
280-299	(64) 78.58	(39) 78.30	(32) 78.24	(22) 78.91	(3) 78.70
300-319	(38) 78.65	(27) 79.93	(33) 79.37	(19) 80.87	-
320-339	(28) 80.61	(17) 79.65	(8) 79.82	(12) 80.94	-
340-359	(9) 80.18	(8) 77.96	(8) 80.27	(5) 81.40	-
360-379	(8) 80.36	(6) 79.46	(5) 82.64	(3) 80.81	-
380-399	(4) 80.32	(4) 80.50	(1) 81.11	(4) 77.09	-
400-419	(3) 81.11	(2) 78.64	(1) 80.48	-	-
420-439	-	-	-	-	-
440-459	-	(1) 78.92	-	-	-
460-479	-	(1) 82.90	-	(1) 80.92	-
Total hogs	1465	1072	1142	1232	308

PROTEIN EXPERIMENTS

Mr. Hankins reported the following on results of experiments at Beltsville, Md. to determine the influence of low-protein vs. high-protein rations on the character of fat produced.

PROTEIN EXPERIMENTS

April 13, 1927 - December 7, 1928

The primary object of this series of experiments was to study the influence of low-protein versus high-protein rations on the character and amount of fat formed by the hog. Four different experiments were conducted. Five rations were studied, the approximate nutritive ratios being 1:2, 1:4, 1:6, 1:8 and 1:10. The different feed mixtures were composed as follows:

<u>Ration</u>	<u>Pounds</u>	<u>Per cent</u>
1. Hominy	100	66.67
Dried blood	40	26.67
Alfalfa meal	7	4.66
Mineral mixture	3	2.00
2. Hominy	100	77.77
Dried blood	20	15.56
Alfalfa meal	6	4.67
Mineral mixture	2.57	2.00
3. Hominy	100	84.85
Dried blood	10	8.48
Alfalfa meal	5.5	4.67
Mineral mixture	2.36	2.00
4. Hominy	100	88.89
Dried blood	5	4.44
Alfalfa meal	5.25	4.67
Mineral mixture	2.25	2.00
5. Hominy	100	92.46
Dried blood	1	.92
Alfalfa meal	5	4.62
Mineral mixture	2.16	2.00

The hogs in these experiments were hand-fed, individually. Feeding results are available on a total of 28 hogs.

The pigs ranged in initial weight from 67 pounds to 93 pounds and were fed in most cases to approximately 200 pounds, the range in these cases being from 184 pounds to 206 pounds. In a few instances the rate of gain was low and the hogs were slaughtered before reaching the approximate

weight of 200 pounds. There were 7 of such hogs and the final weights were 144, 155, 156, 163, 166, 170, and 177. The respective average daily gains were 0.59, .67, .73, .71, .83, .89, and .73 of a pound.

The following table gives² summary of the feeding results, including data from all 28 hogs:

Ration	1	2	3	4	5
Number of hogs	8	5	7	4	3
Average initial weight	78.5	80.2	77.4	78.8	75.3
" final "	198.6	186.6	188.0	174.8	185.3
" gain	120.1	106.4	110.6	96.0	110.0
" number of days on feed	105	102.2	100.3	114.2	97.7
" daily gain	1.14	1.04	1.10	.84	1.13
Average amount of feed consumed per 100 lbs. gain	339	355	335	382	391

For the purpose of obtaining a more direct comparison between high-protein and low-protein rations the data from Rations 1 and 2, on one hand, and from Rations 3, 4, and 5, on the other hand, are compared in the following table:

Ration	1 & 2	3, 4, & 5
Number of hogs	13	14
Average initial weight	79.2	77.4
Average final weight	194.0	183.6
" gain	114.8	106.2
Average number of days on feed	103.9	103.7
" daily gain	1.10	1.02
" amount of feed consumed per 100 lbs. gain	345	359

The average carcass gradings and refractive indexes by ration groups were as follows:

Ration	1	2	3	4	5
Aver. committee grading	MH(1.6)	MH(2.2)	MH(1.9)	MH(1.8)	H(1.0)
" R. I. (back fat)	1.4592	1.4593	1.4593	1.4595	1.4592
" thickness " "	32	29	32	25	31

The distribution of the carcass gradings, was as follows:

Ration	1	2	3	4	5
No. carcasses- H	4	-	4	1	3
" " MH	3	4	1	3	-
" " MS	1	1	1	-	-
" " S	-	-	1	-	-

Analyses on the entire body were made on 14 hogs distributed according to ration and including most of those which made the best gains. Besides the usual refractive-index readings on all samples of fat, special analyses have been made on selected ones.

The results on composition of the carcass show wide variations within the ration group. Thus in ration group 1 there is a range in fat content from 31.1 per cent to 40.6 per cent. In fact this range covers that for all the animals in the other groups. The averages by ration group follow:

Ration	1	2	3	4	5
No. animals	6	2	3	1	2
Composition of body:					
Water - per cent	47.8	48.4	48.0	50.7	45.7
Protein " "	13.3	13.3	13.0	13.9	13.3
Fat " "	35.7	35.0	35.8	32.4	38.4
Ash " "	3.1	3.1	2.8	3.1	2.6
Aver. committee grading	H(1.4)	MH(2.0)	H(1.0)	H(1.0)	H(1.0)
Refractive index	1.4592	1.4593	1.4588	1.4594	1.4588
Thickness (back fat)	34	34	34	26	34

When ration group 1 and 2 are averaged together and 3, 4, and 5 are likewise averaged there is very little difference between the two as the following results show:

Ration	1 and 2	3, 4, and 5
No. hogs	8	6
Water per cent	48.4	48.1
Protein " "	13.3	13.4
Fat " "	35.0	35.5
Ash " "	3.1	2.9
Grading (Aver. Com.)	MH (1.6)	H (1.0)
Refractive index	1.4593	1.4590
Thickness (back fat)	34 m.m	33 m.m

The fatty acid separations on 5 hogs, all indicating uniformly hard fat were as follows:

Ration	1		3	5	
Hog	A	B	C	D	E
Saturated acids-%	39.0	35.8	36.8	39.1	39.5
Oleic acid per cent	51.6	55.1	54.6	51.5	52.0
Linolic " " "	5.0	5.2	4.2	4.6	4.0

Added Oil

Cottonseed Oil Experiment, July 17-October 23, 1928
Beltsville, Md.

An experiment was conducted at the U. S. Animal Husbandry Experiment Farm, Beltsville, Md., to determine the effects of cottonseed oil on the composition of the lard, when fed an amount of 12 per cent cottonseed oil in a ration low in fat.

One lot of the 4 hogs averaging 72 lbs. initial weight, and of spring 1928 farrow were used.

The pigs were hand fed, twice daily, in amounts they would readily clean up of the following ration:

65 parts hominy grits
17 " tankage
5 " alfalfa meal
12 " cottonseed oil
1 " mineral mixture

The following table summarizes feeding results for the period of July 17-October 23, 1928.

No. hogs on test	4
No. hog days on test	392
Total initial weight	287
Average initial weight	71.75
Total final weight	827
Average final weight	206.75
Total Gain	540
Average gain per pig	135
" daily gain per pig	1.38
Total feed consumed	1792
Hominy grits	926
*Brewers' Rice	94
*Cornmeal	145
Tankage	304
Alfalfa meal	90
Cottonseed oil	215
Mineral mixture	18

* For a short period no hominy could be had in Washington. Consequently brewers' rice was substituted in place of hominy in the ration from Sept. 13 to Sept. 21, and cornmeal was substituted in place of hominy in the ration from Sept. 21 to Oct. 1.

Effects of Cottonseed Oil in Ration on Firmness of the Fat.

Prepared and presented by N. R. Ellis.

Further results are available on the effect of cottonseed oil added at different levels to basal rations of corn or hominy on the firmness and composition of the fat. In addition to the work reported last year on 4 and 8 per cent additions of oil, we have data on 12 per cent of added oil. On the corn ration plus 12 per cent oil all the carcasses were soft while on the hominy ration plus 12 per cent oil 3 were medium soft and 1 was medium hard. A complete study of the fatty acid composition of the lards from the various lots is in progress. The separation of the unsaturated from the saturated acids, which is already completed showed high amounts of the latter group in the same order corresponding to the firmness of the carcasses. We are analyzing the saturated fatty acids to determine the proportions found in different samples. It is hoped that this will give us a further insight into the behavior of the cottonseed oil in the body.

The results on this experiment appear to warrant the following conclusions.

Experiments have shown that corn, peanut and soybean oils when present in the ration either naturally contained in the feed or as added oil have a softening effect on the body fat which increases with increasing content in the ration.

On the other hand cottonseed oil has a hardening effect at low levels of intake which changes to softening at higher levels. Hardest hogs have been produced on a basal ration of corn or hominy plus 4 per cent of oil. The addition of 8 per cent oil resulted in a slight increase in softness while 12 per cent oil produced soft or medium soft hogs.

The following reports on the Quality in Pork experiments were presented and discussed by Mr. Bedenbaugh of the Mississippi Station; Mr. Hostetler of the North Carolina Station and Mr. Hankins for the Michigan, Ohio and Beltsville Stations.

Pork Study at U. S. Animal Husbandry Experiment Farm, Beltsville, Md.
(Beltsville Farm Hogs)

1930 - 29

Pork Study at U. S. Animal Husbandry Experiment Farm, Beltsville, Md.
(Beltsville Farm Hogs)

	1 1 1	2 2 2 2	3 3 3 3	Let number	1 1 1	2 2 2	3 3 3 3	Let number	1 1 1	2 2 2 2	3 3 3 3
Lot number	28.6 37.3 98.6	28.8 91.2 121.3 127.2	37.1 90.2 101.4 122.2	28.6 37.3 98.6	28.8 91.2 121.3 127.2	37.1 90.2 101.4 122.2	28.6 37.3 98.6	28.8 91.2 121.3 127.2	37.1 90.2 101.4 122.2	28.6 37.3 98.6	28.8 91.2 121.3 127.2
Reg number	B S S	B S S	B S S	B S S	B S S	B S S	B S S	B S S	B S S	B S S	B S S
Sex	C.W. D.J. P.C.	C.W. P.C. J.W. J.W.	D.J. P.C. P.C. J.W.	C.W. D.J. P.C.	C.W. P.C. J.W. J.W.	D.J. P.C. P.C. J.W.	C.W. D.J. P.C.	C.W. P.C. J.W. J.W.	D.J. P.C. P.C. J.W.	C.W. D.J. P.C.	C.W. P.C. J.W. J.W.
Feeding during experiment	Penicillin, Sulphadiazine	Penicillin, Sulphadiazine	Penicillin, Sulphadiazine	Penicillin, Sulphadiazine	Penicillin, Sulphadiazine	Penicillin, Sulphadiazine	Penicillin, Sulphadiazine	Penicillin, Sulphadiazine	Penicillin, Sulphadiazine	Penicillin, Sulphadiazine	Penicillin, Sulphadiazine
Days on experiment	55 55 55	62 62 62 62	56 56 56 56	55 55 55	62 62 62 62	56 56 56 56	55 55 55	62 62 62 62	56 56 56 56	55 55 55	62 62 62 62
Initial weight	122 128 133	133 120 122 119	124 124 121 128	122 128 133	133 120 122 119	124 124 121 128	122 128 133	133 120 122 119	124 124 121 128	122 128 133	133 120 122 119
Final gain	104 82 93	97 91 68 79	84 72 93 82	104 82 93	97 91 68 79	84 72 93 82	104 82 93	97 91 68 79	84 72 93 82	104 82 93	97 91 68 79
Final weight (pound live)	226 210 226	230 211 190 198	208 196 214 210	226 210 226	230 211 190 198	208 196 214 210	226 210 226	230 211 190 198	208 196 214 210	226 210 226	230 211 190 198
Average daily gain	1.89 1.49 1.69	1.56 1.47 1.10 1.27	1.50 1.29 1.66 1.46	1.89 1.49 1.69	1.56 1.47 1.10 1.27	1.50 1.29 1.66 1.46	1.89 1.49 1.69	1.56 1.47 1.10 1.27	1.50 1.29 1.66 1.46	1.89 1.49 1.69	1.56 1.47 1.10 1.27
Days at slaughter (days)	259 260 190	259 196 251 257	252 254 257 267	259 260 190	259 196 251 257	252 254 257 267	259 260 190	259 196 251 257	252 254 257 267	259 260 190	259 196 251 257
Live weight at slaughter	230 210 228	225 206 182 192	208 192 213 212	230 210 228	225 206 182 192	208 192 213 212	230 210 228	225 206 182 192	208 192 213 212	230 210 228	225 206 182 192
Market grade	MW1 MW2 MW2	MW1 MW2 LW2 LW1	MW2 LW2 MW2 MW1	MW1 MW2 MW2	MW1 MW2 LW2 LW1	MW2 LW2 MW2 MW1	MW1 MW2 MW2	MW1 MW2 LW2 LW1	MW2 LW2 MW2 MW1	MW1 MW2 MW2	MW1 MW2 LW2 LW1
Age and place of slaughter	7M 7M 6- 4445, Cummings, D.C.	7M 7M 7M 7M 4445, Cummings, D.C.	7M 7M 7M 7M 4445, Cummings, D.C.	7M 7M 6- 4445, Cummings, D.C.	7M 7M 7M 7M 4445, Cummings, D.C.	7M 7M 7M 7M 4445, Cummings, D.C.	7M 7M 6- 4445, Cummings, D.C.	7M 7M 7M 7M 4445, Cummings, D.C.	7M 7M 7M 7M 4445, Cummings, D.C.	7M 7M 6- 4445, Cummings, D.C.	7M 7M 7M 7M 4445, Cummings, D.C.
Breast weight (pound)	188 148 180	186 172 146 154	160 156 170 164	188 148 180	186 172 146 154	160 156 170 164	188 148 180	186 172 146 154	160 156 170 164	188 148 180	186 172 146 154
" " (cold)	183 162 170	180 167 - 150	155 150 164 161	183 162 170	180 167 - 150	155 150 164 161	183 162 170	180 167 - 150	155 150 164 161	183 162 170	180 167 - 150
Breast percent (cold wt.-final wt.)	80.97 77.4 75.22	78.26 79.45 - 75.76	74.52 74.53 76.64 76.17	80.97 77.4 75.22	78.26 79.45 - 75.76	74.52 74.53 76.64 76.17	80.97 77.4 75.22	78.26 79.45 - 75.76	74.52 74.53 76.64 76.17	80.97 77.4 75.22	78.26 79.45 - 75.76
Firmness of cooked carcass	4.0 4.0 4.0	H 7M - 7M	7M 8 - 8	4.0 4.0 4.0	H 7M - 7M	7M 8 - 8	4.0 4.0 4.0	H 7M - 7M	7M 8 - 8	4.0 4.0 4.0	H 7M - 7M
Intensive index of back fat	6.28 6.22 6.28	5.72 5.76 - 5.74	6.10 6.04 6.18 6.00	6.28 6.22 6.28	5.72 5.76 - 5.74	6.10 6.04 6.18 6.00	6.28 6.22 6.28	5.72 5.76 - 5.74	6.10 6.04 6.18 6.00	6.28 6.22 6.28	5.72 5.76 - 5.74
Distance of back fat (in. m.)											
Point (a)	4.9 4.1 3.5	4.3 4.7 - 4.9	3.5 3.1 3.6 3.5	4.9 4.1 3.5	4.3 4.7 - 4.9	3.5 3.1 3.6 3.5	4.9 4.1 3.5	4.3 4.7 - 4.9	3.5 3.1 3.6 3.5	4.9 4.1 3.5	4.3 4.7 - 4.9
(b)	4.8 4.4 3.8	3.8 4.5 - 4.6	4.1 3.7 3.4 5.0	4.8 4.4 3.8	3.8 4.5 - 4.6	4.1 3.7 3.4 5.0	4.8 4.4 3.8	3.8 4.5 - 4.6	4.1 3.7 3.4 5.0	4.8 4.4 3.8	3.8 4.5 - 4.6
(c)	3.3 3.5 2.8	3.3 3.6 - 3.9	2.8 2.7 2.6 3.6	3.3 3.5 2.8	3.3 3.6 - 3.9	2.8 2.7 2.6 3.6	3.3 3.5 2.8	3.3 3.6 - 3.9	2.8 2.7 2.6 3.6	3.3 3.5 2.8	3.3 3.6 - 3.9
(d)	4.1 4.6 3.5	3.8 3.8 - 4.3	4.0 3.7 3.5 4.5	4.1 4.6 3.5	3.8 3.8 - 4.3	4.0 3.7 3.5 4.5	4.1 4.6 3.5	3.8 3.8 - 4.3	4.0 3.7 3.5 4.5	4.1 4.6 3.5	3.8 3.8 - 4.3
(e)	4.8 5.6 4.3	4.8 5.2 - 5.4	4.4 5.0 3.9 5.3	4.8 5.6 4.3	4.8 5.2 - 5.4	4.4 5.0 3.9 5.3	4.8 5.6 4.3	4.8 5.2 - 5.4	4.4 5.0 3.9 5.3	4.8 5.6 4.3	4.8 5.2 - 5.4
Length of carcass (in. m.)											
Measurement (a)	84.1 84.3 89.3	84.8 82.4 - 830	87.2 80.2 84.2 84.2	84.1 84.3 89.3	84.8 82.4 - 830	87.2 80.2 84.2 84.2	84.1 84.3 89.3	84.8 82.4 - 830	87.2 80.2 84.2 84.2	84.1 84.3 89.3	84.8 82.4 - 830
(b)	57.4 52.5 54.8	570 515 - 508	538 512 530 515	57.4 52.5 54.8	570 515 - 508	538 512 530 515	57.4 52.5 54.8	570 515 - 508	538 512 530 515	57.4 52.5 54.8	570 515 - 508
(c) f (d)	135.5 136.8 144.1	135.8 133.9 - 133.8	140.0 131.4 137.2 135.7	135.5 136.8 144.1	135.8 133.9 - 133.8	140.0 131.4 137.2 135.7	135.5 136.8 144.1	135.8 133.9 - 133.8	140.0 131.4 137.2 135.7	135.5 136.8 144.1	135.8 133.9 - 133.8
Depth of carcass (in. m.)											
(a)	4.3 5.0 3.1	3.6 3.9 - 4.2	3.9 3.6 3.1 4.7	4.3 5.0 3.1	3.6 3.9 - 4.2	3.9 3.6 3.1 4.7	4.3 5.0 3.1	3.6 3.9 - 4.2	3.9 3.6 3.1 4.7	4.3 5.0 3.1	3.6 3.9 - 4.2
(b)	1.35 1.46 1.18	1.34 1.22 - 1.23	1.33 1.18 1.18 1.28	1.35 1.46 1.18	1.34 1.22 - 1.23	1.33 1.18 1.18 1.28	1.35 1.46 1.18	1.34 1.22 - 1.23	1.33 1.18 1.18 1.28	1.35 1.46 1.18	1.34 1.22 - 1.23
(c)	3.32 3.17 3.15	3.39 3.10 - 3.20	3.25 3.01 3.05 3.42	3.32 3.17 3.15	3.39 3.10 - 3.20	3.25 3.01 3.05 3.42	3.32 3.17 3.15	3.39 3.10 - 3.20	3.25 3.01 3.05 3.42	3.32 3.17 3.15	3.39 3.10 - 3.20
(d)	3.59 3.58 3.44	3.76 3.49 - 3.42	3.45 3.33 3.42 3.74	3.59 3.58 3.44	3.76 3.49 - 3.42	3.45 3.33 3.42 3.74	3.59 3.58 3.44	3.76 3.49 - 3.42	3.45 3.33 3.42 3.74	3.59 3.58 3.44	3.76 3.49 - 3.42
Circumference of right fore leg at smallest point (in. m.)	13.7 14.2 15.0	15.3 15.4 - 13.6	14.6 14.9 14.7 14.6	13.7 14.2 15.0	15.3 15.4 - 13.6	14.6 14.9 14.7 14.6	13.7 14.2 15.0	15.3 15.4 - 13.6	14.6 14.9 14.7 14.6	13.7 14.2 15.0	15.3 15.4 - 13.6
Perimeter of ham											
Measurement (a) (in. m.)	2.70 2.78 2.92	2.82 2.81 - 2.73	2.93 2.81 2.96 2.70	2.70 2.78 2.92	2.82 2.81 - 2.73	2.93 2.81 2.96 2.70	2.70 2.78 2.92	2.82 2.81 - 2.73	2.93 2.81 2.96 2.70	2.70 2.78 2.92	2.82 2.81 - 2.73
(b)	5.73 5.35 5.50	5.78 5.73 - 5.08	5.14 5.21 5.26 5.21	5.73 5.35 5.50	5.78 5.73 - 5.08	5.14 5.21 5.26 5.21	5.73 5.35 5.50	5.78 5.73 - 5.08	5.14 5.21 5.26 5.21	5.73 5.35 5.50	5.78 5.73 - 5.08
% (b) of (a)	21.2 19.4 18.4	20.8 20.9 - 18.6	17.5 18.5 17.7 17.6	21.2 19.4 18.4	20.8 20.9 - 18.6	17.5 18.5 17.7 17.6	21.2 19.4 18.4	20.8 20.9 - 18.6	17.5 18.5 17.7 17.6	21.2 19.4 18.4	20.8 20.9 - 18.6
Width through hams											
Measurement (a) (in. m.)	15.6 14.0 14.9	15.9 14.6 - 13.9	13.8 13.1 14.6 14.4	15.6 14.0 14.9	15.9 14.6 - 13.9	13.8 13.1 14.6 14.4	15.6 14.0 14.9	15.9 14.6 - 13.9	13.8 13.1 14.6 14.4	15.6 14.0 14.9	15.9 14.6 - 13.9
(b)	15.7 14.6 14.0	15.3 14.1 - 13.1	13.8 14.0 14.3 15.1	15.7 14.6 14.0	15.3 14.1 - 13.1	13.8 14.0 14.3 15.1	15.7 14.6 14.0	15.3 14.1 - 13.1	13.8 14.0 14.3 15.1	15.7 14.6 14.0	15.3 14.1 - 13.1
Total	31.3 28.6 28.9	31.2 28.7 - 27.8	27.6 27.1 28.9 29.5	31.3 28.6 28.9	31.2 28.7 - 27.8	27.6 27.1 28.9 29.5	31.3 28.6 28.9	31.2 28.7 - 27.8	27.6 27.1 28.9 29.5	31.3 28.6 28.9	31.2 28.7 - 27.8
Width through shoulders											
Measurement (a) "	13.7 13.5 13.6	14.9 13.7 - 12.2	14.1 12.4 13.1 12.6	13.7 13.5 13.6	14.9 13.7 - 12.2	14.1 12.4 13.1 12.6	13.7 13.5 13.6	14.9 13.7 - 12.2	14.1 12.4 13.1 12.6	13.7 13.5 13.6	14.9 13.7 - 12.2
(b) "	15.7 14.6 13.7	15.7 13.8 - 13.1	12.4 14.0 13.0 15.5	15.7 14.6 13.7	15.7 13.8 - 13.1	12.4 14.0 13.0 15.5	15.7 14.6 13.7	15.7 13.8 - 13.1	12.4 14.0 13.0 15.5	15.7 14.6 13.7	15.7 13.8 - 13.1
Total	29.4 28.1 27.3	30.6 27.5 - 25.3	26.5 26.4 26.1 28.1	29.4 28.1 27.3	30.6 27.5 - 25.3	26.5 26.4 26.1 28.1	29.4 28.1 27.3	30.6 27.5 - 25.3	26.5 26.4 26.1 28.1	29.4 28.1 27.3	30.6 27.5 - 25.3
Cutting yield											
Weight of untrimmed hams	42.0 37.8 40.5	40.1 40.2 32.1	37.0 35.9 41.6 35.4	42.0 37.8 40.5	40.1 40.2 32.1	37.0 35.9 41.6 35.4	42.0 37.8 40.5	40.1 40.2 32.1	37.0 35.9 41.6 35.4	42.0 37.8 40.5	40.1 40.2 32.1
" " trimmed hams	34.0 31.3 33.6	31.5 32.4 29.7	29.7 27.4 32.2 36.0	34.0 31.3 33.6	31.5 32.4 29.7	29.7 27.4 32.2 36.0	34.0 31.3 33.6	31.5 32.4 29.7	29.7 27.4 32.2 36.0	34.0 31.3 33.6	31.5 32.4 29.7
" " untrimmed loins	48.2 30.8 32.5	26.0 21.8 19.0	19.1 16.5 20.8 20.8	48.2 30.8 32.5	26.0 21.8 19.0	19.1 16.5 20.8 20.8	48.2 30.8 32.5	26.0 21.8 19.0	19.1 16.5 20.8 20.8	48.2 30.8 32.5	26.0 21.8 19.0
" " trimmed loins	26.8 20.4 22.9	14.4 11.9 10.4	11.1 10.0 10.4 10.9	26.8 20.4 22.9	14.4 11.9 10.4	11.1 10.0 10.4 10.9	26.8 20.4 22.9	14.4 11.9 10.4	11.1 10.0 10.4 10.9	26.8 20.4 22.9	14.4 11.9 10.4
" " untrimmed shoulders	48.9 37.1 42.7	33.3 30.4 28.6	27.6 26.4 27.6 27.9	48.9 37.1 42.7	33.3 30.4 28.6	27.6 26.4 27.6 27.9	48.9 37.1 42.7	33.3 30.4 28.6	27.6 26.4 27.6 27.9	48.9 37.1 42.7	33.3 30.4 28.6
" " trimmed shoulders	30.7 27.2 28.4	21.2 20.7 19.0	20.5 19.6 22.6 19.7	30.7 27.2 28.4	21.2 20.7 19.0	20.5 19.6 22.6 19.7	30.7 27.2 28.4	21.2 20.7 19.0	20.5 19.6 22.6 19.7	30.7 27.2 28.4	21.2 20.7 19.0
" " untrimmed loins	40.2 39.2 39.9	17.8 15.2 17.2	14.2 13.6 17.2 17.4	40.2 39.2 39.9	17.8 15.2 17.2	14.2 13.6 17.2 17.4	40.2 39.2 39.9	17.8 15.2 17.2	14.2 13.6 17.2 17.4	40.2 39.2 39.9	17.8 15.2 17.2
" " trimmed loins	20.0 22.2 24.2	11.1 11.1 11.1	11.1 11.1 11.1 11.1	20.0 22.2 24.2	11.1 11.1 11.1	11.1 11.1 11.1 11.1	20.0 22.2 24.2	11.1 11.1 11.1	11.1 11.1 11.1 11.1	20.0 22.2 24.2	11.1 11.1 11.1
" " back fat	18.8 15.6 14.0	11.1 11.1 11.1	11.1 11.1 11.1 11.1	18.8 15.6 14.0	11.1 11.1 11.1	11.1 11.1 11.1 11.1	18.8 15.6 14.0	11.1 11.1 11.1	11.1 11.1 11.1 11.1	18.8 15.6 14.0	11.1 11.1 11.1
" " spine ribs	2.6 2.5 4.2	4.1 4.1 4.1	4.1 4.1 4.1 4.1	2.6 2.5 4.2	4.1 4.1 4.1	4.1 4.1 4.1 4.1	2.6 2.5 4.2	4.1 4.1 4.1	4.1 4.1 4.1 4.1	2.6 2.5 4.2	4.1 4.1 4.1

Lot number	1 1 1 1	2 2 2 2	3 3 3 3
Hog number	83 84 90 1027	286 40 85 114	57 70 88 1183
Sex	B B B B	B B B B	B B B B
Breed	D.B. D.B. D.B. P.C.	C.W. D.B. P.C. D.B.	P.C. D.B. P.C. P.C.
Feeding during experiment	Baron, Landry, & Co. Mineral-Free Chow	Carroll, Landry, & Co. Mineral-Free Chow	Carroll, Landry, & Co. Mineral-Free Chow
Days on experiment	56 56 56 56	56 56 56 56	56 56 56 56
Initial weight	126 135 101 125	93 111 102 129	131 124 133 93
Total gain	85 109 98 105	84 94 103 107	82 87 79 75
Final weight (Feed lot)	211 244 199 230	177 205 205 236	213 211 212 168
Average daily gain	1.52 1.95 1.75 1.88	1.50 1.68 1.84 1.91	1.46 1.55 1.41 1.34
Age at slaughter (days)	— — — 207	176 — — —	— — — 194
Live weight at slaughter	204 240 192 228	174 201 199 231	207 206 206 162
Market grade	MW3 MW2 LW2 MW1	LW1 MW2 MW1 MW2	MW2 MW2 MW2 LW1
Cure	L, M, M, L	M, M, M, M	M, M, M, M
Date and place of slaughter	May 19, Cummings, D.C.	May 19, Cummings, D.C.	May 19, Cummings, D.C.
Dressed weight (hot)	164 200 156 184	142 162 164 194	170 168 170 126
" " (cold)	160 194 152 179	139 157 159 179	164 162 166 123
Dressed percent (cold wt., final wt.)	76.83 79.57 76.88 77.83	78.53 76.57 77.54 80.08	77.00 76.78 78.30 78.21
Firmness of chilled carcass	80 80 80 80	H H H H	M H M H
Refractive index of back fat	624 622 623 627	579 574 574 571	600 599 599 600
Carcass measurements			
Thickness of back fat (m.m.)			
Point (a)	29 39 39 38	33 46 29 48	35 49 32 45
(b)	47 50 43 44	35 40 48 53	43 41 36 37
(c)	28 38 33 35	26 30 36 49	23 35 33 28
(d)	32 48 56 46	26 46 41 67	31 47 38 29
(e)	61 59 56 57	48 58 54 63	44 56 54 53
Length of carcass (m.m.)			
Measurement (a)	806 782 746 765	718 765 700 782	742 766 775 675
(b)	572 571 523 563	526 567 538 575	572 566 572 524
(a) & (b)	1378 1353 1267 1328	1244 1332 1238 1357	1314 1332 1347 1199
Depth of carcass (m.m.)			
(a)	82 48 56 46	26 46 41 57	31 47 38 29
(b)	116 130 102 126	96 128 115 140	116 126 124 106
(c)	327 326 323 343	311 331 310 334	319 335 336 316
Circumference of right fore-leg at smallest part (m.m.)	140 145 141 141	132 142 142 143	146 143 114 128
Plumpness of ham			
Measurement (a) (m.m.)	380 375 440 515	426 438 360 485	470 428 482 416
(b) "	464 525 452 505	435 437 509 474	465 426 493 426
% (B) of (a)	122.1 140.0 98.34 98.06	102.1 74.71 141.4 98.14	98.44 99.53 102.3 102.4
Width through ham			
Measurement (a) (m.m.)	147 162 140 151	138 140 151 143	150 140 145 121
(b) "	140 153 135 143	133 135 139 143	140 130 141 137
Total	287 315 275 294	271 275 290 286	290 270 286 260
Width through shoulders			
Measurement (a) (m.m.)	139 150 135 143	130 137 143 152	143 140 131 140
(b) "	126 141 132 125	142 130 126 140	136 130 135 125
Total	265 291 267 268	272 267 267 292	279 270 266 265
Cutting Yield			
Weight of untrimmed ham	409 446 340 442	329 348 418 406	407 353 406 286
" " trimmed "	329 370 274 357	273 281 354 333	360 283 337 236
" " untrimmed bacon	29.8 40.8 30.0 35.7	26.2 30.6 28.7 41.9	30.2 33.5 31.3 24.3
" " trimmed "	16.8 25.8 17.2 20.9	17.3 19.0 18.9 25.0	19.2 20.5 18.1 14.0
" " untrimmed shoulder	40.6 49.4 38.0 44.7	36.5 41.2 41.6 47.1	43.3 40.8 34.3 31.2
" " trimmed "	27.6 33.8 28.9 31.0	25.6 28.0 27.9 33.4	30.6 29.1 30.6 22.6
" " untrimmed loin	35.8 33.6 36.8 40.8	31.2 37.0 31.7 43.9	36.3 37.4 34.1 27.2
" " trimmed "	21.1 23.4 19.5 22.8	18.2 18.4 17.6 20.6	22.0 18.6 20.0 14.6
" " back fat	— — — —	— — — —	— — — —
" " spare ribs	4.2 4.2 3.5 3.9	2.8 3.0 3.4 3.7	3.7 3.8 4.6 2.7

Lot number	1 1 1 1	2 2 2 2	3 3 3 3
Hog number	83 84 90 1027	286 40 85 114	57 70 88 1183
Weight of shoulder ribs	83 84 90 1027	286 40 85 114	57 70 88 1183
" " feet	83 84 90 1027	286 40 85 114	57 70 88 1183
" " sausage trimmings	83 84 90 1027	286 40 85 114	57 70 88 1183
" " lard	83 84 90 1027	286 40 85 114	57 70 88 1183
" " skin	83 84 90 1027	286 40 85 114	57 70 88 1183
" " miscellaneous	83 84 90 1027	286 40 85 114	57 70 88 1183
" " head	83 84 90 1027	286 40 85 114	57 70 88 1183
Tenderness of ham, tested mechanically			
Uncooked	445 52 48 28	42 07 315 58	32 07 265 28
Cooked	20 26 17 17	20 22 11 38	23 24 26 21
Color reading Raw Lean—percent light	16 30 20 22	20 24 27 28	23 24 26 21
Histological examination	Yes Yes Yes Yes	Yes Yes Yes Yes	Yes Yes Yes Yes
Physical analysis of ham			
Total weight of ham	164 152 132 177	105 129 175 160	175 140 160 110
% lean	69.09 67.1 67.1 67.1	60.4 55.2 62.4 57.1	57.5 57.5 57.9 52.1
% fat	24.5 28.5 28.5 26.4	22.4 28.5 28.5 26.4	24.1 28.5 27.1 28.7
% skin	6.7 5.1 4.9 4.6	6.1 5.5 5.3 4.3	5.6 8.2 6.2 7.3
% bone	9.9 9.7 9.5 9.5	11.1 11.1 8.9 9.5	10.6 12.3 9.8 11.9
Chemical analysis of ham			
Lean—% water	65.2 66.1 67.0 66.3	65.4 65.9 71.5 68.2	67.8 66.2 68.6 68.3
% ash	0.9 0.9 0.9 0.9	1.0 0.9 1.0 0.9	0.9 0.9 0.9 0.9
% fat	12.4 14.6 15.9 14.3	15.4 16.0 8.7 12.1	12.4 15.5 12.4 12.7
% protein	9.3 11.6 19.0 19.5	18.3 18.0 19.3 19.2	19.7 18.1 18.6 18.4
Fat—% water	11.6 10.8 13.4 11.0	13.6 12.5 15.5 11.8	14.0 15.0 13.9 12.4
% ash	0.2 0.2 0.2 0.2	0.2 0.2 0.2 0.2	0.2 0.2 0.2 0.2
% fat	8.6 8.7 13.1 17.0	12.8 12.7 11.5 10.5	12.0 11.1 13.0 17.3
% protein	8.0 2.9 3.9 2.8	3.3 4.0 3.5 2.7	4.0 4.3 2.5 2.9
Total edible portion	50.3 49.4 49.2 49.3	51.4 48.2 49.7 48.3	52.4 48.1 51.2 49.4
% water	0.7 0.7 0.7 0.7	0.7 0.6 0.7 0.6	0.7 0.7 0.7 0.6
% ash	25.7 26.4 26.9 27.0	33.9 31.9 37.0 42.1	32.5 35.6 34.9 38.6
% fat	14.1 13.8 14.0 13.6	14.6 13.0 13.2 12.5	15.2 13.2 12.8 12.9
% protein	12.6 13.4 13.0 13.6	12.9 12.7 13.3 13.7	13.5 12.8 13.2 13.1
Calculated fatness of animal			
Appearance of uncooked ham sample	See upper right hand corner of sheet.		
" " cooked "	— — — —	— — — —	— — — —
" " uncooked loin "	— — — —	— — — —	— — — —
" " cooked "	— — — —	— — — —	— — — —
Out used for cooking			
Method of cooking			
Weight of sample used for cooking	556 257 508 721 5747	448 571 452 69 4723	577 346 456 56 4031
% loss—evaporation	10.2 12.2 10.3 17.8 16.37	10.0 10.0 10.0 17.07	11.2 11.9 17.15 15.66
% " drippings	15.44 12.09 12.90 14.06	15.66 15.66 14.62 17.04	13.33 15.26 16.87 16.22
% " total	25.67 24.29 23.20 31.93	25.66 25.66 24.62 34.11	24.53 27.16 34.02 31.88
Palatability of cooked ham			
Intensity—aroma	9.80 9.80 9.80 9.80	5.20 4.60 9.80 9.80	5.20 9.80 5.90 9.80
Texture	4.80 4.75 4.60 5.40	4.80 4.40 5.00 4.60	5.20 4.40 4.60 4.80
Flavor of fat	2.80 4.40 4.40 4.60	4.60 4.40 4.40 4.20	4.40 4.60 4.20 4.60
" " lean	4.20 4.60 4.50 4.80	4.40 4.40 4.80 4.60	4.60 4.60 4.60 4.20
Tenderness	4.40 5.00 5.00 5.60	5.00 5.00 5.00 5.60	4.75 4.80 5.00 5.00
Quality of juice	4.40 5.00 4.60 5.60	5.00 4.80 5.00 5.20	4.80 4.80 4.60 5.20
Quantity " "	4.80 5.40 5.20 5.40	5.00 5.00 5.00 5.20	5.20 5.20 5.40 5.00
Desirability—aroma			
Flavor of fat	5.20 5.60 5.40 5.40	5.00 5.40 5.00 5.20	5.60 5.20 5.00 5.20
" " lean	5.20 5.60 5.75 5.60	5.00 5.40 5.00 5.60	5.20 5.60 5.00 5.60
Quality of juice	4.60 5.20 5.00 6.00	5.20 5.20 5.20 5.75	5.75 5.40 5.20 5.60
Quantity " "	5.20 5.60 5.40 5.80	4.40 5.40 5.00 5.20	5.20 4.80 5.40 5.60

Lot number	1 1 1 1	2 2 2 2	3 3 3 3
Hog number	83 84 90 1027	286 40 85 114	57 70 88 1183
Appearance of ham samples			
Shape	uncooked	4.00 4.00 3.67 3.00	5.00 4.33 4.67 4.33
Trim	uncooked	3.67 4.67 4.00 4.00	4.00 4.00 5.00 4.00
Proportion, fat to lean—uncooked	uncooked	3.50 4.00 2.50 4.50	4.00 4.50 4.50 4.00
Color	uncooked	5.00 4.33 4.67 3.33	5.00 4.33 4.67 4.33
Color of lean cooked	uncooked	5.00 4.00 5.00 4.33	5.00 4.33 4.67 4.33
Color of fat cooked	uncooked	4.00 4.33 4.67 4.00	4.67 4.33 4.67 3.33
Firmness	uncooked	2.33 3.00 2.33 3.33	4.00 4.33 4.67 4.00
Marbling	uncooked	4.33 5.00 4.67 3.67	5.00 4.67 5.00 4.00
Texture	uncooked	2.67 3.67 4.00 4.00	5.00 5.00 3.67 4.67
		1.67 2.00 1.67 1.67	4.00 2.67 3.00 3.00
		2.00 3.33 3.33 3.00	3.67 3.00 3.67 2.33
		3.67 3.67 3.67 4.00	3.33 5.00 4.33 3.00
			4.00 4.33 3.33 4.00

Lot number	1 1 1 1 1	2 2 2 2 2
Hog number	21 39 40 53 56	9 34 51 54 90
Sex	S S B B S	S S S B B
Breed	PC PC PC PC DJ	PC PC PC DJ PC
Feeding during experiment	Corn + Tankage Saff-Tail	Corn + M.Y. Soybean Saff-Tail
Days on experiment	58 58 58 58 58	58 58 58 58 58
Initial weight	108 98 101 99 103	105 109 111 103 89
Total gain	115 105 111 111 105	81 70 71 108 70
Final weight (feed lot)	223 203 212 210 208	186 179 202 211 159
Average daily gain	1.94 1.77 1.88 1.88 1.77	1.37 1.18 1.54 1.83 1.18
Age at slaughter	255 248 248 203 248	255 248 203 248 240
Live weight at slaughter	—	—
Market grade	MW1 MW2 MW3 MW4 MW5	MW2 MW3 MW4 MW5 MW6
Type	M + L - M M M M	L M - M M M M
Date and place of slaughter	December 6, 1928 at	Birmingham, B.C.
Dressed weight (hot)	—	—
" (cold)	175 159 163 162 160	135 132 155 155 119
Dressed percent (cold wt.-final wt.)	76.48 78.33 76.89 77.14 76.72	72.57 75.74 76.73 75.46 74.84
Pinnose of chilled carcasses	H M M H H S S S S	S S S S S
Refractive index of back fat	1.402 Range 1.400-1.404	1.402 Range 1.404-1.409
Carcass measurements		
Thickness of back fat (m.m.)		
Point (a)	40 40 41 52 36	30 40 33 40 27
(b)	38 36 40 46 45	31 39 30 39 27
(c)	25 25 32 32 31	21 25 22 28 19
(d)	35 33 40 42 40	29 32 27 40 27
(e)	46 50 52 52 45	35 40 37 49 38
Length of carcass (m.m.)		
Measurement (a)	871 843 843 838 835	850 810 845 851 776
(b)	545 525 515 530 525	550 510 535 540 525
(a) & (b)	1416 1368 1358 1368 1360	1400 1320 1380 1398 1301
Depth of carcass (m.m.)		
Measurement (a)	30 28 40 38 39	21 31 28 33 26
(b)	125 120 124 120 135	70 107 105 135 110
(c)	320 315 328 285 315	275 282 275 303 310
(d)	334 346 350 338 357	300 313 335 341 336
Circumference of right fore leg at smallest point (m.m.)	144 150 144 141 142	144 137 147 144 135
Pinnose of ham		
Measurement (a) (mm.)	302 286 286 282 296	293 283 302 310 280
(b)	542 546 533 545 542	494 488 531 520 469
% (b) of (a)	178.5 190.9 193.4 192.3 194.9	168.6 172.4 175.8 167.7 167.5
Width through hams		
Measurement (a)	—	—
(b)	—	—
Total	—	—
Width through shoulders		
Measurement (a)	—	—
(b)	—	—
Total	—	—
Cutting yield		
Weight of untrimmed ham	441 31.7 39.0 37.7 29.7	36.0 33.1 39.9 37.1 31.2
" " trimmed "	346 31.8 32.4 31.2 33.3	29.5 27.4 32.8 31.1 25.2
" " untrimmed loins	23.0 30.0 31.7 34.2 30.6	23.4 24.4 25.7 32.1 28.0
" " trimmed "	22.1 17.4 17.7 21.1 18.1	12.9 14.7 15.7 19.0 11.7
" " untrimmed shoulders	134 39.1 40.3 39.9 38.8	34.0 34.2 37.7 37.9 30.4
" " trimmed "	103 26.1 27.4 17.6 25.7	23.0 22.4 26.5 24.3 20.7
" " untrimmed loins	32.7 37.0 37.9 35.6 37.6	27.9 28.0 35.9 34.1 25.3
" " trimmed "	27.3 21.1 20.5 18.8 21.1	18.5 16.8 21.5 18.7 15.3
" " back fat "	14.8 15.1 16.7 16.1 15.3	8.8 10.3 11.5 14.4 9.3
" " spare ribs	3.5 3.4 3.2 3.2 3.4	3.0 3.0 3.0 3.1 2.6

Lot number	1 1 1 1 1	2 2 2 2 2
Hog number	21 39 40 53 56	9 34 51 54 90
Weight of shoulder ribs	3.3 2.9 2.9 3.0 3.5	3.0 2.9 3.0 3.7 2.7
" " feet	4.5 4.2 4.2 3.9 3.9	4.0 3.5 3.9 3.9 3.5
" " sausage trimmings	4.6 5.0 5.0 3.7 5.0	4.8 5.0 4.3 5.5 4.3
" " lard "	28.8 28.5 30.0 31.0 27.5	17.5 20.5 24.1 27.5 17.2
" " skin "	3.2 3.4 3.8 3.1 4.1	3.2 3.0 3.4 3.8 3.0
" " miscellaneous "	1.1 0.6 0.5 0.9 0.7	1.3 0.5 1.4 0.6 0.8
" " head	15.7 13.4 13.4 13.5 13.2	13.1 11.7 12.4 13.6 11.8
Tenderness of ham, tested mechanically		
Uncooked	45 44 39 47 39	38 41 40 39 36
Cooked	21 24 24 25 31	29 22 24 22 25
Color reading { Raw Lean - percentage Red }	46 34 33 33 37	49 35 37 39 33
Histological examination		
Physical analysis of ham		
Total weight of ham	181 162 166 156 143	146 139 141 155 127
% lean	50.1 57.9 56.6 52.9 59.3	59.4 58.0 54.3 59.2 56.6
% fat	33.8 27.2 28.6 26.5 26.4	25.5 27.5 31.0 25.7 24.8
% skin	4.4 5.0 5.3 5.2 5.7	4.8 4.1 5.0 5.8 5.5
% bone	8.7 9.9 9.5 10.4 8.6	10.3 9.7 9.7 9.3 11.1
Chemical analysis of ham		
Lean - % water	70.9 68.4 68.8 67.6 72.2	74.0 68.3 72.4 69.5 69.1
% ash	1.0 1.0 1.0 1.1 1.1	1.1 1.0 1.1 1.0 1.0
% fat	8.2 11.4 12.2 11.8 6.0	5.7 11.0 6.4 10.7 10.6
% protein	20.3 18.4 19.1 20.4 21.0	19.5 20.1 20.6 19.4 19.7
Fat - % water	12.6 12.2 13.0 10.8 16.3	13.6 10.8 15.4 12.2 12.4
% ash	—	—
% fat	14.1 15.4 13.6 16.4 7.9	12.0 8.6 8.0 8.5 8.5
% protein	3.4 3.1 3.2 3.4 4.3	3.9 3.6 4.4 3.5 4.0
Total edible portion		
% water	48.2 57.2 48.8 47.1 58.0	55.7 49.8 57.6 52.2 52.2
% ash	0.6 0.6 0.6 0.7 0.8	0.8 0.7 0.7 0.7 0.7
% fat	37.6 35.1 37.8 35.5 28.8	28.7 35.4 33.5 32.2 32.7
% protein	13.7 13.5 13.4 14.2 15.9	14.8 14.8 14.8 14.6 15.0
Calculated fatness of animal		
Appearance of uncooked ham sample		
" " cooked "	6 6 5 5 5.5	3 4 3 3 3.5
" " uncooked loin "	6 6 6 6 7	6 6 6 6 6
" " cooked "	5 6 5 4 6	3 4 4 4 3.5
" " cooked "	5 6 5 3 6.5	6 6 6 6 5.5
Out used for cooking		
Method of cooking	Standard	Standard
Weight of sample used for cooking	55.0 51.3 47.0 47.0 51.6	42.7 37.5 47.3 47.0 36.6
% loss - evaporation	17.3 15.3 13.3 12.3 13.6	17.3 15.3 12.6 17.3 17.3
% - drippings	18.5 13.3 11.3 12.0 14.3	12.7 10.6 11.3 12.3 13.1
% - total	32.7 28.6 24.6 24.3 27.9	30.0 25.9 23.9 29.6 30.4
Palatability of cooked ham		
Intensity - Aroma	4.60 4.20 4.20 4.60 4.80	4.70 4.80 4.60 4.60 4.80
Texture	4.60 4.20 4.20 4.60 5.00	4.20 4.25 4.00 4.60 5.00
Flavor of fat	4.60 4.60 4.60 5.00 5.10	4.60 4.60 4.60 4.60 4.80
Flavor of lean	5.20 4.60 4.60 5.00 5.00	4.60 4.60 4.60 4.60 5.00
Tenderness	6.00 5.60 5.60 5.70 6.00	5.70 5.60 4.00 5.20 5.60
Quality of juice	5.20 4.60 4.60 5.00 5.00	4.60 4.60 4.00 4.60 4.60
Quantity of juice	4.90 5.80 4.60 4.20 3.80	3.80 4.90 3.20 3.80 3.60
Desirability - Aroma	5.00 4.80 5.20 5.00 5.20	5.80 5.80 5.70 5.90 5.60
Flavor of fat	5.00 4.60 4.80 5.40 5.20	5.00 5.00 5.20 5.00 5.20
Flavor of lean	6.00 5.40 5.40 5.60 5.00	5.70 5.70 5.70 5.40 5.80
Quality of juice	5.60 4.60 5.20 5.40 5.60	4.60 5.20 4.90 4.60 5.20
Quantity of juice	5.40 4.00 5.20 5.00 5.20	4.70 5.00 3.80 4.60 4.70

Lot number	1 1 1 1 1	2 2 2 2 2
Hog number	21 39 40 53 56	9 34 51 54 90
Out used for cooking	Loin	Loin
Method of cooking	Standard	Standard
Weight of sample used for cooking - grams	132.3 171.3 154.1 132.4 182.6	162.1 130.3 175.3 176.3 137.1
% loss - evaporation	25.3 11.2 14.0 12.3 12.5	23.5 23.8 11.4 12.3 0.37
% - drippings	6.82 6.30 4.54 4.15 8.60	6.25 8.63 5.70 7.55 4.67
% - total	15.31 17.51 18.62 16.49 21.17	15.24 17.93 16.71 19.90 13.67
Palatability of cooked loin		
Intensity - Aroma	4.10 4.40 4.40 4.00 4.60	4.60 4.80 4.80 4.60 4.80
Texture	4.60 4.00 4.80 4.00 4.40	4.60 4.60 3.80 4.60 5.20
Flavor of fat	4.40 4.60 4.80 5.00 4.60	4.80 4.20 4.40 5.00 4.80
Flavor of lean	4.60 4.60 4.60 4.60 4.60	4.60 4.80 4.80 4.60 4.80
Tenderness	5.60 5.80 4.40 4.40 3.20	3.80 4.60 2.60 4.40 3.80
Quality of juice	3.80 4.20 4.60 4.20 4.00	4.20 4.20 3.80 4.00 4.40
Quantity of juice	3.80 4.00 3.60 3.60 3.20	3.80 3.80 3.20 3.20 3.00
Desirability - Aroma	5.00 5.00 5.00 5.00 4.60	5.20 5.00 5.60 5.40 5.20
Flavor of fat	5.20 4.80 5.00 3.80 4.80	5.20 5.00 5.20 4.80 4.80
Flavor of lean	5.60 5.40 5.40 5.60 5.00	5.40 5.60 5.40 5.40 5.20
Quality of juice	4.60 4.80 4.80 4.80 4.80	4.60 4.80 4.80 4.60 5.00
Quantity of juice	4.40 4.40 4.40 4.40 4.20	4.20 4.20 4.20 4.20 4.40

Lot number	19-A	19-B	19-F	19-F	19-F	19-E	19-E
Hog number	2	5	15	19	21	13	14
Sex	B	B	B	B	B	B	B
Breed	DJ	DJ	DJ	DJ	DJ	PC	DJ
Feeding during experiment	Harding feed	Harding feed	Harding feed	Harding feed	Harding feed	Harding feed	Harding feed
Days on experiment	117	121	112	112	112	121	117
Initial weight	63	64	61	61	62	71	64
Total gain	67	154	184	177	155	191	169
Final weight (feed lot)	230	218	245	238	217	262	233
Average daily gain	143	127	164	158	138	158	144
Age at slaughter (days)	229	229	235	233	229	236	229
Live weight at slaughter							
Market grade	MW2	MW2	MW1	MW1	MW1	MW1	MW1
Type	M	M	M	M	M	M	M
Date and place of slaughter	4/1/22	4/1/22	4/1/22	4/1/22	4/1/22	4/1/22	4/1/22
Dressed weight (hot)	164	165	173	172	159	203	178
" (cold)	164	165	173	172	159	203	178
Dressed percent (cold wt.-final wt.)	71.30	75.67	70.41	72.27	73.27	77.47	74.43
Firmness of chilled carcass	H	H	M	H	H	L	H
Refractive index of neck fat	1.4579	1.4573	1.4579	1.4579	1.4570	1.4602	1.4570
Carcass measurements							
Thickness of back fat (m.m.)							
Point (a)	39	41	42	45	45	45	41
(b)	35	44	44	47	51	49	49
(c)	24	32	36	41	35	48	34
(d)	37	52	48	42	42	43	44
(e)	44	52	47	57	50	52	56
Length of carcass (m.m.)							
Measurement (a)	775	801	761	765	758	741	791
(b)	590	561	584	577	556	600	580
(a) ÷ (b)	1365	1362	1345	1342	1341	1341	1371
Depth of carcass (m.m.)							
(a)	37	52	48	42	42	43	44
(b)	112	132	121	111	110	116	118
(c)	350	343	332	313	332	317	346
(d)							
Circumference of right fore leg at smallest point (m.m.)	134	142	146	145	138	156	136
Plumpness of ham							
Measurement (a) (m.m.)	380	365	370	378	365	390	376
(b) "	481	450	454	490	445	496	490
(a) ÷ (b)	1266	1233	1227	1296	1219	1272	1303
Width through hams							
Measurement (a) (m.m.)	134	138	136	135	131	150	134
(b) "	133	144	136	140	134	152	137
Total	267	282	272	275	265	302	271
Width through shoulders							
Measurement (a) (m.m.)	143	146	148	140	134	150	141
(b) "	134	139	133	145	139	150	135
Total	277	285	281	285	273	300	276
Cutting Yields							
Weight of untrimmed hams	389	393	398	414	375	501	409
" " trimmed "	322	218	337	354	312	405	341
" " untrimmed bacons	341	360	361	313	331	394	395
" " trimmed "	207	225	230	206	202	219	218
" " untrimmed shoulders	409	384	411	410	387	572	442
" " trimmed "	276	263	297	296	280	351	315
" " untrimmed loins	354	390	409	421	362	460	387
" " trimmed "	203	218	217	235	179	229	213
" " back fat	144	166	190	179	164	230	177
" " spare ribs	40	35	33	32	33	41	39

Lot number	19-A	19-B	19-F	19-F	19-F	19-E	19-E
Hog number	2	5	15	19	21	13	14
Height of shoulder ribs	39	31	30	30	29	41	37
" " feet	38	37	42	42	35	46	35
" " sausage trimmings	47	41	41	44	47	77	58
" " lard "	264	287	313	285	290	419	326
" " skin "	49	23	27	32	36	33	35
" " miscellaneous trimmings	0.9	1.0	0.95	1.1	1.0	1.0	1.0
" " head	146	141	150	150	136	158	145
Tenderness of ham, tested mechanically							
Uncooked	60	56.5	65	46.5		31	60
Cooked							
Color reading	24	25	29	25	24	29	29
Histological examination	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Physical analysis of ham							
Total weight of ham	157	163	175	182	158	205	172
% lean	56.6	52.1	53.3	55.3	55.0	62.7	58.0
% fat	27.7	32.4	32.8	30.1	29.2	32.3	30.0
% skin	5.3	5.3	4.8	5.2	6.2	5.7	5.2
% bone	10.4	10.2	9.1	8.9	9.6	9.3	9.3
Chemical analysis of ham							
Lean - % water	67.9	68.0	68.7	67.6	67.3	68.7	68.5
% ash	0.3	0.9	0.9	1.0	1.0	0.9	0.9
% fat	13.0	13.2	11.6	11.1	13.2	13.1	13.2
% protein	18.9	18.7	19.7	19.7	19.0	18.9	18.2
Fat - % water	14.1	13.6	11.0	13.7	12.1	11.5	11.1
% ash	0.2	0.2	0.2	0.2	0.2	0.2	0.2
% fat	52.4	52.6	52.9	52.7	51.3	52.6	54.9
% protein	3.8	3.5	3.0	3.5	2.9	3.2	3.3
Total edible portion							
% water	58.2	47.2	46.4	48.7	48.1	46.7	48.4
% ash	0.6	0.6	0.6	0.7	0.7	0.6	0.6
% fat	25.8	39.9	40.3	36.2	38.1	42.8	38.4
% protein	13.9	12.9	13.3	14.1	13.4	12.9	13.0
Calculated fatness of animal	142	143	141	139	144	138	140
Appearance of uncooked ham sample	See upper right hand corner of sheet						
" " cooked "							
" " uncooked loin "							
" " cooked "							
Out used for cooking		Fresh one-half ham					
Method of cooking		Standard					
Weight of sample used for cooking - grams	505.2	501.3	513.2	546.3	500.4	641.6	549.7
% loss - evaporation	18.55	19.73	17.67	17.05	17.35	16.18	16.71
% " - drippings	15.08	16.82	17.32	15.91	17.95	13.54	18.72
% " - total	33.63	36.55	35.00	32.96	35.30	29.72	35.42
Palatability of cooked ham							
Intensity - Aroma	4.40	4.40	4.60	5.00	4.40	4.60	5.00
Texture	4.40	4.40	4.80	4.40	4.20	5.00	4.20
Flavor of fat	4.80	4.40	4.80	4.80	4.40	4.40	4.20
" " lean	4.40	4.40	4.40	4.40	4.60	4.20	4.40
Tenderness	5.60	5.60	6.40	6.40	5.40	5.60	5.60
Quality of juice	4.80	4.40	4.80	4.40	4.40	4.80	5.00
Quantity " "	4.80	4.20	4.20	4.20	4.40	4.80	4.40
Desirability - Aroma	5.60	5.40	5.40	5.20	5.00	5.40	5.00
Flavor of fat	5.40	5.40	5.80	5.00	5.00	5.40	5.40
" " lean	5.60	5.35	5.40	5.20	5.40	5.40	5.60
Quality of juice	5.00	4.80	5.20	4.40	4.50	5.20	5.40
Quantity " "	5.20	5.00	4.80	4.40	5.00	5.20	4.80

Lot number	19-A	19-B	19-F	19-F	19-F	19-E	19-E
Hog number	2	5	15	19	21	13	14
Appearance of ham samples							
Shape	uncooked	uncooked	uncooked	uncooked	uncooked	uncooked	uncooked
Tris	uncooked	uncooked	uncooked	uncooked	uncooked	uncooked	uncooked
Proportion, fat to lean-uncooked	5.00	4.67	4.67	4.67	4.00	3.33	4.33
cooked	4.67	4.67	4.67	4.33	4.00	4.00	4.67
Color	uncooked	uncooked	uncooked	uncooked	uncooked	uncooked	uncooked
Color of lean cooked	3.67	4.33	3.67	3.67	5.00	4.33	3.00
Color of fat cooked	2.33	2.33	2.33	2.33	3.00	4.67	3.33
Firmness uncooked	5.00	4.33	4.33	5.00	4.67	1.33	1.00
Marbling uncooked	4.67	3.33	3.33	4.33	3.33	2.33	3.00
Texture uncooked	3.67	3.67	3.67	2.67	3.00	3.00	3.00

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Lot number	1	1	1	1	1	3	3	3	3	3
Hog number	67	121	132	163	178	22	63	104	130	166
Sex	B	B	B	B	B	B	B	B	B	B
Age during experiment	DJ	DJ	DJ	DJ	DJ	DJ	DJ	DJ	DJ	DJ
Age at experiment	Ground corn, ground soybeans, minerals	Ground corn, ground soybeans, minerals	Ground corn, ground soybeans, minerals	Ground corn, ground soybeans, minerals	Ground corn, ground soybeans, minerals	Ground corn, ground soybeans, minerals	Ground corn, ground soybeans, minerals	Ground corn, ground soybeans, minerals	Ground corn, ground soybeans, minerals	Ground corn, ground soybeans, minerals
Weight at experiment	119	119	119	119	119	119	119	119	119	119
Weight at slaughter	66	72	56	56	48	52	75	65	69	61
Weight of carcass (fired lot)	167	194	116	189	94	110	210	142	178	169
Weight of chilled carcass	233	266	172	245	142	162	255	207	247	230
Weight of chilled carcass (day)	140	1630.97	1570.79	1570.79	1570.79	0.90	1.76	1.19	1.50	1.42
Weight of chilled carcass (concurrent judgment)	228	223	219	212	210	234	228	227	219	212
Weight of chilled carcass (concurrent judgment)	MW1	MW1	LW2	MW1	LL3	LW2	MW1	MW2	MW1	MW1
Weight of chilled carcass (concurrent judgment)	M+M	M+M	M+M	M+M	M+M	M+M	M+M	M+M	M+M	M+M
Weight of chilled carcass (concurrent judgment)	Nov. 12, 1928 - Banning, O.C.	Nov. 12, 1928 - Banning, O.C.	Nov. 12, 1928 - Banning, O.C.	Nov. 12, 1928 - Banning, O.C.	Nov. 12, 1928 - Banning, O.C.	Nov. 12, 1928 - Banning, O.C.	Nov. 12, 1928 - Banning, O.C.	Nov. 12, 1928 - Banning, O.C.	Nov. 12, 1928 - Banning, O.C.	Nov. 12, 1928 - Banning, O.C.
Weight of chilled carcass (concurrent judgment)	173	145.5	121	181	93	107.5	219	154	187	169.0
Weight of chilled carcass (concurrent judgment)	S	MH	MS	MH	MS	H	H	H	H	H
Weight of chilled carcass (concurrent judgment)	1460.3	1460.1	1460.3	1459.9	1459.9	1469.5	1469.2	1460.1	1459.0	1459.0
Thickness of back fat (mm.)	Point	(a)	(b)	(c)	(d)	(e)	(a)	(b)	(c)	(d)
Thickness of back fat (mm.)	38	55	28	53	30	30	56	47	56	52
Thickness of back fat (mm.)	43	57	35	50	27	35	57	49	58	48
Thickness of back fat (mm.)	28	43	29	38	23	24	42	32	48	34
Thickness of back fat (mm.)	42	58	36	59	31	38	56	43	58	50
Thickness of back fat (mm.)	50	63	48	63	38	49	78	50	75	57
Length of carcass (mm.)	Measurement	(a)	(b)	(c)	(d)	(e)	(a)	(b)	(c)	(d)
Length of carcass (mm.)	860	827	754	853	733	708	855	800	790	816
Length of carcass (mm.)	555	535	502	540	466	472	553	522	528	530
Length of carcass (mm.)	1418	1362	1256	1393	1199	1180	1438	1322	1318	1346
Depth of carcass (mm.)	Measurement	(a)	(b)	(c)	(d)	(e)	(a)	(b)	(c)	(d)
Depth of carcass (mm.)	40	57	32	59	28	37	55	40	56	49
Depth of carcass (mm.)	117	168	120	148	113	110	140	115	140	152
Depth of carcass (mm.)	312	340	244	339	290	293	340	298	330	325
Depth of carcass (mm.)	345	390	333	370	307	320	375	335	392	360
Circumference of right fore leg at smallest point (mm.)	Measurement	(a)	(b)	(c)	(d)	(e)	(a)	(b)	(c)	(d)
Circumference of right fore leg at smallest point (mm.)	145	153	136	150	131	132	156	142	147	145
Circumference of right fore leg at smallest point (mm.)	308	285	285	290	250	260	302	285	300	292
Circumference of right fore leg at smallest point (mm.)	537	566	489	552	460	491	586	516	591	540
Circumference of right fore leg at smallest point (mm.)	178.4	192.6	176.6	190.3	184.0	188.8	194.0	181.1	197.0	184.9
Width through hams (mm.)	Measurement	(a)	(b)	(c)	(d)	(e)	(a)	(b)	(c)	(d)
Width through hams (mm.)	140	153	125	144	108	120	151	134	145	143
Width through hams (mm.)	134	151	125	146	110	121	153	131	145	144
Width through hams (mm.)	274	304	250	290	218	241	304	265	290	287
Width through shoulders (mm.)	Measurement	(a)	(b)	(c)	(d)	(e)	(a)	(b)	(c)	(d)
Width through shoulders (mm.)	148	158	138	139	110	128	155	140	146	152
Width through shoulders (mm.)	138	150	122	156	114	116	162	135	159	144
Width through shoulders (mm.)	286	308	260	295	224	244	317	275	305	296
Weight of antitumors hams	40.1	32.1	31.3	39.8	22.0	25.3	42.4	35.0	43.3	37.0
Weight of antitumors hams	55.5	35.6	26.7	33.4	17.7	20.8	39.0	29.5	36.4	30.6
Weight of antitumors hams	32.9	21.9	21.4	18.7	11.1	11.1	18.7	12.7	16.7	11.1
Weight of antitumors hams	21.0	25.1	18.9	27.3	12.1	13.2	30.6	20.4	27.7	24.7
Weight of antitumors hams	44.4	43.3	28.5	40.2	23.4	26.8	51.9	38.0	44.8	31.1
Weight of antitumors hams	39.0	30.7	22.3	28.2	16.6	19.8	32.1	27.7	33.6	29.2
Weight of antitumors hams	40.3	49.4	26.9	46.6	19.5	24.1	53.6	42.8	43.5	38.7
Weight of antitumors hams	21.5	11.2	15.8	21.6	11.0	13.2	24.1	24.1	18.1	17.4
Weight of antitumors hams	16.2	25.9	9.7	23.2	7.9	9.5	26.8	15.2	26.8	19.7
Weight of antitumors hams	3.2	3.1	2.2	3.3	2.1	2.1	3.5	3.0	2.6	3.1
Weight of antitumors hams	3.2	3.0	2.2	3.8	2.0	2.2	3.2	2.4	2.6	2.8
Weight of antitumors hams	4.3	4.4	3.4	4.2	3.1	3.0	5.2	3.7	4.0	4.2

Lot number	1	1	1	1	1	3	3	3	3	3
Hog number	67	121	132	163	178	22	63	104	130	166
Weight of average trimmings	275	455	175	381	147	172	415	212	429	368
Weight of average trimmings	27	3.6	2.8	2.6	1.5	2.0	4.5	3.4	3.0	2.4
Weight of average trimmings	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Weight of average trimmings	150	162	110	131	9.4	100	124	138	163	153
Tenderness of ham, tested mechanically	79	74	63	63	69	61	77	36	76	65
Uncooked	40	40	41	42	43	42	41	38	42	41
Color reading [RawLean-percent of Red]	40	40	41	42	43	42	41	38	42	41
Histological examination	40	40	41	42	43	42	41	38	42	41
Physical analysis of ham	40	40	41	42	43	42	41	38	42	41
Total weight of ham	167	176	105	162	9.0	103	191	146	187	150.1
% fat	58.5	44.3	57.1	57.6	50.5	58.0	53.7	54.2	46.2	50.6
% protein	24.8	36.1	25.7	22.7	27.6	23.9	32.2	20.4	40.5	26.0
% water	6.6	5.0	7.0	5.6	6.6	6.8	5.5	5.6	5.2	4.2
% ash	10.1	10.6	10.2	10.1	12.0	11.3	8.6	9.8	8.1	9.2
Chemical analysis of ham	65.0	68.6	69.1	69.9	66.7	70.3	69.8	68.7	65.8	66.0
Lean - % water	0.9	0.9	0.9	1.0	0.7	0.9	0.9	0.9	0.9	0.9
Lean - % fat	11.0	11.4	9.6	8.5	14.8	9.4	9.5	11.1	14.6	14.0
Lean - % protein	19.7	19.4	20.2	20.5	18.1	20.3	20.1	19.0	19.2	18.6
Lean - % ash	14.4	12.3	13.1	11.5	14.7	12.4	12.7	13.7	11.9	13.0
Total soluble protein	45.2	45.0	45.7	47.3	49.1	53.4	48.4	44.9	46.6	44.1
% water	0.6	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.4	0.5
% fat	32.2	42.6	32.3	38.1	37.3	31.0	37.7	36.8	47.9	43.1
% protein	15.3	12.6	15.1	10.9	10.6	15.6	13.9	13.5	11.7	12.5
Calculated portion of animal	4	6	5	5	6	5	6	5	5	5
Appearance of whole ham sample	5	5	6	6	6	6	4	6	5	6
Appearance of whole ham sample	5	5	5	5	4	5	6	5	4	5
Appearance of whole ham sample	4	4	5	5	6	5	6	6	5	5
Cut and for cooking	Standard roasting	Standard roasting	Standard roasting	Standard roasting	Standard roasting	Standard roasting	Standard roasting	Standard roasting	Standard roasting	Standard roasting
Method of cooking	7470	8000	5040	7654	3010	4632	8004	6087	7338	6000
Weight of sample used for cooking - grams	20.35	17.00	20.20	16.31	16.37	16.30	17.18	17.36	16.79	18.23
% loss - evaporation	14.53	21.85	12.70	19.60	15.67	16.30	21.80	18.11	23.30	17.37
% loss - drippings	34.30	40.00	33.30	37.89	21.01	32.23	38.00	28.47	40.00	26.00
Palatability of cooked ham	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Intensity - Aroma	3.80	4.40	4.40	4.20	4.00	4.00	4.40	4.20	3.80	3.80
Intensity - Texture	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Intensity - Flavor of fat	4.80	4.80	4.80	4.80	4.80	4.80	4.80	4.80	4.80	4.80
Intensity - Flavor of lean	6.00	5.80	6.20	5.20	6.10	5.80	5.60	5.80	5.80	5.60
Intensity - Tenderness	4.80	5.00	5.00	4.20	5.10	5.00	4.80	4.80	4.80	4.80
Intensity - Quality of juice	4.20	4.60	3.80	3.80	3.80	4.20	4.40	4.00	4.00	4.20
Intensity - Quantity of juice	5.40	5.20	5.40	5.20	5.00	5.20	5.10	5.20	5.00	5.00
Desirability - Aroma	5.40	5.40	5.20	5.00	5.10	5.60	5.40	5.20	4.80	5.20
Desirability - Texture	5.60	5.80	5.80	5.40	5.60	5.60	5.80	5.80	5.20	5.60
Desirability - Flavor of fat	5.20	5.20	5.20	5.00	5.00	5.40	5.60	5.20	4.80	4.80
Desirability - Flavor of lean	4.80	5.20	4.60	4.60	4.60	5.00	5.10	4.80	4.80	5.20
Desirability - Tenderness	5.2	5.1	6.1	5.9	7.1	5.9	5.0	6.0	5.8	7.0
Desirability - Quality of juice										
Desirability - Quantity of juice										
BHE number										

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Lot number	1	1	1	1	1	3	3	3	3	3
Hog number	67	121	132	163	178	22	63	104	130	166
Lot used for cooking										
Method of cooking										
Weight of sample used for cooking										
% loss - drippings										
Palatability of cooked loin										
Intensity of flavor										
Texture										
Flavor of fat										
Flavor of lean										
Tenderness										
Quantity of juice										
Quantity of juice										
Flavor of fat										
Flavor of lean										
Quantity of juice										
Quantity of juice										
BHE number	56	55	62	64	75	57	54	63	65	74

Mr. Robison of the Ohio Station reports the following on the Effect of Grains, Fiber, Type, and Weight on the Firmness of the Pork.

An experiment was conducted at the Ohio Station during the winter of 1927-28 to study the "Effect of Grains, Fiber, Type, and Weight On the Yield of Pork Cuts." With the exception of the effect of these factors on the relative firmness of the fat, the test is briefly reported in the proceedings of the American Society of Animal Production for 1928.

A sample of the back fat from each carcass was sent to the Bureau of Animal Industry and the Bureau determined its refractive index. The data on the firmness of the fat are given in the following table. To show the effect of weight or finish each lot is divided into two or more groups on a basis of weight. As pointed out in the report referred to corn contains approximately 4.4 per cent, barley 2.2 per cent, and oat kernels 8.1 per cent of oil or fat. It is not surprising, therefore, to find, that barley produced a firmer fat than corn and that corn produced a firmer fat than oats.

Effect of Grains, Fiber, Type, and Weight on the Firmness of Pork

Lot No.	Breed	No. of pigs	Ration	Final weight at weoster	Weight after trucking and fasting	Ave. daily gain	Ave. thickness of back fat (inches)	Refractive index of back fat	Firmness of fat as indicated by refractive index
1	Yorkshire	5	Corn and supplement	235	222.4	1.39	1.98	1.4599	M. H.
	"	5	" "	150	179	1.09	1.47	1.4604	M. S.
2	Yorkshire	5	Barley and supplement	239.8	223.6	1.34	1.55	1.4597	H.
	"	5	" "	190.0	175.8	1.04	1.22	1.4603	M. S.
3	Yorkshire	3	Oats and supplement	241.8	224.0	1.11	1.59	1.4608	S.
	"	1	" "	206.0	192.0	.98	1.39	1.4612	S.
	"	6	" "	192.3	174.0	.91	1.10	1.4611	S.
4	Duroc-Jersey	5	Corn and supplement	234.9	219.8	1.17	1.86	1.4600	M. H.
	"	5	" "	202.3	191.4	1.05	1.72	1.4600	M. H.
5	Duroc-Jersey	5	Barley and supplement	237.	219.8	1.20	1.70	1.4596	H.
	"	5	" "	194.3	179.8	.93	1.50	1.4595	H.
6	Duroc-Jersey	2	Oats and supplements	241.5	223.	1.03	1.83	1.4610	S.
	"	7	" "	207.1	191.6	.85	1.36	1.4606	S.
	"	1	" "	170.0	158.0	.65	1.31	1.4604	M. S.
9	Duroc-Jersey	6	Hulled oats & supplements	216.25	207.5	1.15	1.84	1.4604	M. S.

Supplement - Tankage, linseed meal, ground alfalfa, minerals.

On both corn and barley the lighter-weight Yorkshires killed out softer than the lighter-weight Durocs. Possibly this was because they carried a thinner covering of fat than the Durocs of the same weight. While both the Yorkshires and the Durocs fed oats killed out soft as indicated by the refractive indexes, in agreement with those fed corn and barley, the lighter Durocs were not as soft as the lighter Yorkshires.

Apparently, unless rations that are very low in oil or fat are fed, it is a difficult proposition to produce hogs carrying a large percentage of lean which will at the same time kill out firm.

Mr. Ellis presented the following report on "Meat Quality: Statistical study on relationship between composition of cuts and entire carcass of hogs."

In the following table, results are given of a study made on the ether extract and physical fat from hogs on which chemical analyses were made on the whole carcass. The ham, bacon, shoulder, and rough loin (with fat back) were boned out separate from the rest of the carcass, separated in fat and lean fractions and analyzed for fat, water, protein, and ash. The order of highest correlation of the ether extract (fat) between the several cuts and the entire carcass was: loin, ham, shoulder, and bacon. In the case of the physical fat (fat as separated from the lean); there is high agreement of the ham fat to the entire carcass fat,

Providing the high correlation here shown is borne out as more data is added, we should be able to dispense with the complete carcass analysis in the near future and rely on the analysis of a particular cut such as the rough loin or ham to predict that of the entire edible carcass.

FAT CONTENT OF HOGS

Variance of per cent of ether extract and physical fat content of four cuts as related to per cent of ether extract and physical fat content of the total edible portion of the carcass. Also variance of per cent of water, protein, and ash as related to per cent of ether extract in the edible portion of a carcass

Cut	b	S E	M	d	Y = a + bx
Ether extract:					
Ham.....	.91	6.39	1.79	33.9	.96 ± .02 : 92.18 : .91x - 12.65
Bacon...	.87	6.52	2.91	61.1	.89 ± .04 : 80.06 : .86x + 16.51
Shoulder	.82	5.87	1.96	38.8	.94 ± .02 : 88.84 : .82x - 3.26
Rough cut					
Loin	1.12	8.10	1.79	59.1	.98 ± .01 : 95.11 : 1.12x 1.25
Physical fat:					
Ham.....	.84	6.65	2.78	32.8	.91 ± .04 : 82.46 : .84x - 9.78
Shoulder	.90	7.56	4.01	34.3	.82 ± .06 : 71.05 : .90x - 10.96
Rough cut					
Loin....	.91	8.53	5.29	60.7	.78 ± .08 : 61.53 : .91x + 14.34
Bacon...		9.58	11.52	62.8	.43 ± .17 : 18.62 :
Water	-.78	5.33		38.0	.99 ± .003 : 98.77 : 78.04 - 78x
Protein	-.19	1.43		10.5	.91 ± .04 : 82.42 : 20.40 - 19x
Ash	-.0122	.066		.439	.92 ± .03 : 85.36 : 1.089 - .0122x
Mean of ether extract fat T.E. = 51.3 4 cuts - 22 observations					
" " physical fat T. E. = 50.5 Water, protein 22 observations					
Ash, 19 observations.					

All the relations are linear except physical-fat content of bacon, a free hand curve best fits this relation. The estimations for bacon follow:

Physical fat content of T E %	Physical fat content of bacon %
35	36
40	47.5
45	56
50	63
55	70
60	75

b - regression coefficient, means that when the p.c of fat in T. E increases one unit the per cent of fat in cut increases the proportion of one unit as stated. S.E. Standard error of estimate - measures the distance from the line of least squares, each way plus or minus, within which space 2 of 3 observations may be expected to fall.

D = Coefficient of determination - this is the square of "r" and expressed as a percentage tells what per cent of relationship exists between two variable: in our problem the percent of variation in the per cent of fat in the cut due to or caused by the variation in per cent of fat in T.E.

Laboratory and Special Work at Beltsville

The following reports on work done at the Beltsville Laboratory were presented by Mr. Ellis.

We have continued the analytical work on lard samples on much the same basis as previous years. Approximately 2000 refractive-index determinations have been made on samples from over 1,200 hogs. In practically all cases, composite samples prepared according to the experimental lots in which the animals were grouped have been given special study. The information obtained will be used in the preparation of future publications on the cooperative experiments. Because of the fact that the hogs were slaughtered and held in the coolers at the Benning abbatoir, the resulting unfavorable conditions for accurate grading, as well as for measuring the fat layer, and securing fat samples, have lessened the value of the results. Preliminary survey of the 1928-29 results compared with those of 1927-28 shows somewhat poorer correlation between carcass grading and refractive index as well as wider variations in the fat-layer measurements.

We have continued studies on the fatty acid distribution of the acids in samples from hogs fed varying proportions of soybeans as well as from those on cottonseed oil and navy beans. In the case of soybean fed hogs, the results of fatty acid separations on the lards bear out the earlier work; namely, that the proportion of soybeans in the ration exerts a marked effect on the composition of the lard. In the case of grazing or free-choice experiments the proportion of soybeans consumed can be roughly estimated by comparison of the results on fat separation to those from "definite proportion" experiments.

The analyses on lards from hogs fed cull navy beans continue to show a considerable proportion of linolic acid. This is contrary to the usual results on low-fat rations such as we have in the experiments conducted by the Michigan Station. It appears that the course of fat metabolism was abnormal to produce this unusual type of fat. It seems to be, first of all, a feeding problem. Work was begun during the past year with rats in an effort to find a way of improving the rate of growth when beans constitute a material part of the ration. When the ration fed to hogs was fed to rats, the differences in gain were in the same general order but showed a wider spread as compared to the gains on the hogs. We expect to continue this work using various supplements in order to obtain better gains. Study of fat composition will be included.

Statistical Study of the 1927-28 Soft-Pork Data with
Particular Reference to the Data on Fat Composition,
Thickness of Fat Layer and Grading.

In line with other work under way in which the Hollereith card system is used to study the immense amount of data that is constantly accumulating, we began a study on the relationships between data on fat composition, grading, fat layer, measurements, and other data. The material for the year 1927-28 was chosen as a starting point. The data on approximately 1,000 hogs totalling between 25,000 and 30,000 items has been studied in part.

Some correlation coefficients are given in the following table.

Coefficients of correlation on 1927-28 data											Ave
Age	Final wt.	Grading Offic.	Ave.	Gr.1.	Gr.2.	Gr.3.	Gr.4.	Gr.5.	Gr.6.	Gr.7.	R.I. Meas
Final wt.											
Slaughter wt.	.95										1928-29 Off. grade - R.I. is .71 -.0
Off.grading											
Ave.		.90									
Gr. 1.		.92	.87								
" 2.		.92	.94	.86							
" 3.		.91	.92	.82	.96						
" 4.		.89	.91	.77	.88	.86					
" 5.		.92	.94	.84	.89	.88	.83				
" 6.		.94	.88	.82	.90	.87	.86	.85			
" 7.		.87	.92	.80	.88	.95	.80	.85	.84		
Ref. Index		.79	.80	.79	.81	.77	.75	.77	.79		
Ave. Meas.	.68									.41	
Meas. A.	.67										.91
" B.	.70										.90
" C.	.63										.90
" D.	.64										.90
" E.	.65										.90

BREED	Number	Final Wt.	Refractive Index.	Thickness of B. F.
Chester White	85	218.5	1.4603	39
Duroc Jersey	261	212	1.4600	41
Poland China	162	210	1.4605	35
Tamworth	159	199	1.4600	39
Crossbred	232	203	1.4601	44
Spotted Poland-Ch.	30	222	1.4606	
Sex				
Barrows	511	211	1.4601	
Sows	419	205	1.4602	

The range in coefficients in the grading comparison including the official committee, the average of all graders and the several individual graders is from 0.80 to 0.98, that of gradings with refractive index from 0.75 to 0.81, of final weight and fat-layer measurements 65 to 70 and between the several measurements and the average 0.91 to 0.96. All of these correlation coefficients show good to very high correlations between the factors. Of particular interest are the values on the refractive index and gradings as well as on final weight and the several measurement figures. It will be noted that the highest correlation is on the second measure "B" which is taken at approximately the 4th vertebrae in front of the spinal curve over the ham. Included in the table is a summary by breeds and sexes covering final weight, refractive index, and thickness of back fat. The Poland China group show the highest refractive index and the thinnest back fat. This summary was made up regardless of feeding and it is possible that the experimental conditions played a factor in the variation in softness between breeds. The results just quoted are in line with those from the California experiments in which Poland Chinas and Duroc-Jerseys were compared.

Germination of Soybeans

The studies on the changes in the amount and degree of unsaturation of soybean oil during germination begun a year ago was continued. In addition to comparisons of various treatments of the seeds during germination, feeding tests on rats were conducted. Fat samples were taken from the rats at the conclusion of the tests. Some of the results are given in the following table:

Results from feeding germinated soybeans to rats at 36 per cent level.

	Ration	Fat % and Iodine no. of soy beans		Rat Lo. No.	fat R. L.
1. Germ indoors fed fresh (Same material as 3	15	Sample I.	Sample II.	103.9	1.4640
" outdoors fed fresh (Same as 4)	16	(Same as 3)	(Same as 4)	93.0	1.4631
2. " indoors fed dry	17	14.3%	17.0	111.9	1.4650
3. " outdoors fed dry	18	130.7	130.5	106.5	1.4648
4. " indoors, incub.dried (Same beans as 3)	19	14.6	16.9	99.5	1.4637
5. " outdoors incub, dried (Same beans as 4)	20	130.	131	79.4	1.4614
		129.0	14.1		
		114.1	102.7 Samp.		
		12.5	14.5 III		
			9.4		
		103.0	90.6 82.0		

Results of control lots of rats with ungerminated soybeans at varying levels.

Low fat control			73.8	1.4600
18% soy beans			99.6	1.4631
36% " "			111.9	1.4651
73% " "			119.1	1.4661

Germination, as is well known, caused a reduction in the oil content. without further treatment there was little change in the unsaturation of the oil as indicated by the iodine number on the oil. When the germinated beans were held in an incubator for 1 to 2 days there was a further drop in the oil content and a pronounced drop in the iodine number particularly in the seeds germinated outdoors in sand. The order of the lots from highest to lowest according to the iodine number and refractive index of rat fats were: 3, 4, 1, 5, 2 and 6 on the samples. When these results are compared to controls, it will be noted that the seeds germinated outdoors and fed green produced body fat somewhat firmer than on a ration containing 18 per cent whole beans. When the same material was incubated and dried, it showed still less softening. These results appear promising. It may be found desirable to do further work on rats as well as on hogs.

Feed Samples from Soft Fork Experiments 1928-29

Analyses by the Food Drug and Insecticide Administration.

Sample No.	Feed	Station	Moisture	Ash	Ether extract	Protein	Crude fiber	Nitrogen free extract
801	Manchu	Beltsville	9.0	5.2	18.4	38.3	4.6	24.5
802	Virginia	"	7.8	4.5	18.3	40.3	5.2	23.9
803	Hahto	"	8.2	5.0	18.5	39.1	1.0	28.2
804	Old Dominion	"	7.8	5.3	18.4	35.0	5.8	27.7
805	Sooty	"	7.0	5.5	16.4	38.3	5.2	27.6
806	Blood meal	"	7.4	4.0	0.8	34.3		
807	Armour tank purchase	"	6.5	24.0	3.1	61.4		
808	Garbage	Indianapolis	4.5	14.1	20.2	28.4	22.8	10.0
810	Hominy	Beltsville	12.9	0.6	0.7	7.6	0.5	77.7
811	Saf. flr. meal	"	6.6	9.9	6.9	38.3	18.4	19.9
812	Peanut ration	"	5.6	4.6	33.4	27.1	4.4	24.9
813	" "	"	5.5	5.3	35.1	30.1	4.2	19.8
814	Shelled corn	Iberia	11.4	1.4	3.9	9.8	1.2	72.3
815	Rice bran	"	7.5	9.6	13.6	13.9	11.0	44.4
816	" polish	"	12.0	6.9	11.3	11.8	2.2	55.8
817	Tankage	"	7.3	12.8	9.3	58.0	3.9	8.7
818	Manchu	Beltsville	9.0	5.5	19.4	41.6	4.1	20.4
819	Old Dominion	"	10.2	4.9	16.8	39.3	6.6	22.6
820	Sooty	"	9.7	5.5	15.9	39.5	5.0	24.4
821	Virginia	"	10.2	5.1	13.5	35.6	5.2	30.4
822	Hahto	"	11.1	5.2	17.3	38.5	4.0	23.9
823	Manchu	"	8.7	5.1	19.4	40.4	4.5	21.9
824	Old Dominion	"	8.9	5.3	19.2	33.9	6.2	26.5
825	Virginia	"	8.7	4.3	18.1	39.1	5.4	23.9
826	Manchu	"	7.0	5.2	21.5	38.2	4.6	23.5
827	Corn	"	11.0	1.4	4.6	9.1	2.2	71.7
828	Shelled corns (Shell e. 1%)	"	6.0	2.4	45.3	29.4	2.4	14.5
829	Harmon	South Carolina	9.3	5.1	20.8	38.4	4.3	24.1
830	Mammoth Yellow	"	9.9	5.1	17.7	38.9	4.3	24.1
831	Biloxi	"	10.1	4.8	18.9	41.9	4.4	19.9
832	Shelled corn ration	"	9.8	4.5	4.3	14.1	3.3	14.0
833	Tankage	"	6.8	13.6	10.7	64.4	---	---
834	Yellow corn	"	11.7	1.3	4.0	9.5	2.2	71.3
835	Cowpeas	McNeill	10.13	3.39	1.26	27.60	---	---
836	Tankage	"	9.75	23.14	1.27	47.17	---	---
837	Yellow corn	"	10.36	1.13	4.36	8.38	---	---
838	Laredo	Arkansas	10.0	4.52	15.0	35.81		
839	Mammoth Yellow	"	9.9	4.70	16.2	40.60		
840	Virginia	"	10.2	4.71	16.5	40.72		
841	Rice bran	"	8.6	11.61	16.6	14.40		
842	" polish	"	10.2	6.45	11.2	13.76		
843	Brewers' rice	"	12.9	4.33	.7	7.33		

Mr. Godbey, Chairman of the General Committee read, the following conclusions agreed upon by the Committee.

Statement of Results
From
Cooperative Soft-Pork Investigations
recommended by
Conference at Asheville, N. C., April 30, -May 3, 1929

(1) Pigs with initial weights of 100 pounds or more and gaining at least $1\frac{1}{3}$ pounds daily on a mixture of ground corn (9 parts or 12 parts) and ground soybeans (1 part) self-fed, free choice, with mineral mixture in dry lot, through a period of approximately 9 weeks or longer, have produced firm carcasses in the majority of cases.

(2) Pigs with initial weights of 100 pounds or less and gaining a maximum of 1 pound daily on a mixture of ground corn (9 parts or 12 parts) and ground soybeans (1 part) self-fed, free choice, with mineral mixture in dry lot, through a period of 15 weeks or less, have produced soft carcasses in the majority of cases.

(3) Pigs with initial weights ranging from approximately 40 to approximately 70 pounds fed raw soybeans with corn and minerals in comparison with cooked soybeans with corn and minerals both rations in dry lot, have produced carcasses of approximately the same degree of firmness at comparable finished weights.

(4) Pigs with initial weights of approximately 50 pounds gaining a maximum of 50 pounds on rations of rice polish or rice bran with tankage and minerals during an eight-week feeding period followed by a gain of at least 70 pounds on brewers' rice with tankage and minerals during a period of eight weeks or more have produced firm carcasses in the usual cases.

(5) Pigs fed low-fat rations varying widely in protein content, with dried blood the principal source of protein, have produced carcasses which were strikingly uniform in composition and firmness of fat. All rations were composed of hominy, dried blood, alfalfa meal and minerals. Owing to the different proportions of dried blood and hominy used the nutritive ratio of the different rations varied from approximately 1:2 to 1:10.

(6) Experiments have shown that corn oil, peanut oil, and soybean oil when present in the ration, either naturally contained or as added oil, have a softening effect on the body fat which increases with increasing oil content in the ration. Cottonseed oil, on the other hand, has shown a distinct hardening effect when added to the extent of 4 per cent of the mixture to basal rations of corn or hominy with supplements. When the amount of cottonseed oil is increased to 8 and 12 per cent respectively, a progressive decrease in firmness results. The 8 per cent addition of cottonseed oil produced hard or medium-hard carcasses and the 12 per cent addition, medium-soft or soft carcasses as compared to hard carcasses on the 4 per cent addition.

Outline of Experiments for 1929 - 30

Cooperative Quality-in-Pork Investigations

Program of Proposed Experiments for 1929-30

Soybean Experiments

(1) Soybean pasture supplemented by a 2.5 per cent ration of ground corn (12 parts) and tankage (1 part), with mineral mixture self-fed, until an average weight of approximately 100 pounds is reached; then shelled corn, tankage, and mineral mixture, self-fed, free choice in dry lot until an average weight of approximately 200 pounds is reached.

(2) Same as (1) except the hogs are to be fed from 100 pounds to 200 pounds on soybean pasture.

(3) Mixture of ground corn (12 parts) and tankage (1 part) full fed twice daily with mineral mixture self-fed on soybean pasture until an average weight of approximately 100 pounds is reached; then shelled corn, tankage, and mineral mixture, self-fed, free choice on soybean pasture until an average weight of approximately 200 pounds is reached.

Pigs with initial weights of 40-50 pounds are to be used in (1), (2), and (3).

Green, growing soybeans are to be used for the pastures. The use of any pasture is to be discontinued when the pods begin to fill. It is anticipated that at most of the stations a succession of plantings will be necessary to supply soybean pasture without any seed (immature or mature) throughout the duration of the experiment.

Mineral mixture composed of finely-ground limestone (10 parts), steamed bone meal (10 parts), and common salt (2 parts) will be used in (1), (2), and (3).

Stations suggested to conduct the work outlined under (1), (2) and (3) are:

Mississippi
North Carolina
South Carolina

Tennessee
U. S. A. H. Experiment Farm
Virginia

(4) Basal mixture of ground corn (6 parts) and ground soybeans (1 part) with the addition of 2 per cent protein in other supplements self-fed, free choice with mineral mixture.

Suggested supplements to furnish the additional 2 per cent of protein are:

Fishmeal
Cottonseed meal
Skinmilk
Dried or semi-solid buttermilk

An example of the feed combination follows:

6.0 lbs ground corn
1.0 " " soybeans
0.25 " fishmeal (to furnish 2% additional
protein. Calculated on basis of 55%
fishmeal)

The mineral mixture to be self-fed, free choice with the mixture of other feeds will be composed of finely-ground limestone (10 parts), steamed bone meal (10 parts), and common salt (2 parts).

It is recommended that one or more of the suggested supplements be fed with the basal mixture in comparison with a check lot self-fed the basal mixture without supplement other than the mineral mixture.

Since the Manchu and Virginia varieties of soybeans have been used in most of the work done with definite proportions of corn and soybeans (6:1 and other proportions) it is recommended that they be used in this work. Additional varieties thought to be more palatable should be used for comparison if facilities will permit.

Pigs with initial weights of approximately 100 pounds are to be used. Each lot is to be finished at an average weight of approximately 225 pounds.

Stations suggested to conduct the work outlined under (4) are:

Indiana North Carolina
Mississippi Ohio
U. S. A. H. Experiment Farm

(5) Mixture of ground corn (6 parts) and ground soybeans (1 part) self-fed, free choice, with mineral mixture.

This is a study of varieties of soybeans. It is intended to make use of varieties which have indicated differences in palatability and gain-producing capacity.

The following varieties are suggested for study:

Biloxi	Laredo
Dunfield	Mammoth Yellow
Haberlandt	Manchu
Hahto	Midwest
Virginia	

It is recommended that each station conducting work under (5) make a comparison at least of two varieties- the one regarded as most satisfactory from the standpoint of palatability and gain-producing capacity with the one regarded as least satisfactory.

The mineral mixture will be the same as given above under (4).

Pigs with initial weights of approximately 100 pounds are to be used. Each lot is to be finished at an average weight of approximately 225 pounds.

Stations suggested to conduct the work outlined under (5) are:

Arkansas	Ohio
Indiana	South Carolina
Mississippi	Virginia
U. S. A. H. Experiment Farm	

(6) Mixture of ground soybeans (12 parts) and tankage (1 part) self-fed, free choice, with mineral mixture.

It is recommended that each station use the variety of soybeans which it regards as best under its condition with respect to palatability and gain-producing capacity.

The mineral mixture will be the same as given under (4)

Pigs with initial weights of approximately 100 pounds are to be used and are to be finished at an average weight of approximately 225 pounds.

Stations suggested to conduct the work outlined under (6) are:

Mississippi	Ohio
North Carolina	U. S. A. H. Experiment Farm.

(7) Mixture of ground corn (12 parts) and tankage (1 part) self-fed, free choice, with mineral mixture.

The mineral mixture will be the same as given under (4).

This is a check lot to be handled in comparison with lots fed and studied under (4), (5), (6), and (8), and particularly in all cases when complete study of the meat is to be made.

Pigs with initial weights of approximately 100 pounds are to be used, and the lot is to be finished at an average weight of approximately 225 pounds.

This study may be conducted in connection with (24) and section (b) of (25).

Stations suggested to conduct the work outlined under (7) and the related sections (4), (5), (6), and (8)- are:

Arkansas	Ohio
Indiana	South Carolina
Mississippi	U. S. A. H. Experiment Farm
North Carolina	Virginia

(8) Raw versus cooked soybeans fed as a supplement to corn with alfalfa meal and minerals.

The beans in both rations are to be fed in the proportion of one part beans to six parts corn. The amount of cooked beans is to be computed on the raw-bean basis.

The pigs on the cooked-bean ration are to be given the same amount of feed daily per head as consumed by the pigs self-fed in the raw-bean lot.

The mineral mixture will be composed of finely-ground limestone (36 parts), raw bone meal (36 parts), common salt (18 parts), and copperas (10 parts).

Pigs with initial weights of approximately 100 pounds will be used and the lots will be finished at an average weight of approximately 225 pounds.

Stations suggested to conduct the work outlined under (8) are:

Ohio
Others if possible

Peanut Experiments

(9) Peanuts with supplements self-fed to produce a gain of approximately 40 pounds followed by ground corn with cottonseed meal and other supplements self-fed to produce a subsequent gain of approximately 120 pounds.

Peanut Ration

Shelled peanuts, ground	82.7	parts
Wheat middlings	5.0	"
Tankage	5.0	"
Alfalfa meal	5.0	"
Common salt	.3	"
Finely-ground limestone	1.0	"
Special bone meal	1.0	"

Hardening Ration

Corn, ground	20.0	parts
Tankage	5.0	"
Cottonseed meal	14.0	"
Alfalfa meal	5.0	"
Common salt	.5	"
Finely-ground limestone	1.0	"
Special bone meal	1.0	"

Pigs with initial weights of from 30 to 49 pounds and a second weight class of from 50 to 84 pounds are to be used in this study. It is desirable that the lighter-weight pigs finish at approximately 200 pounds and the heavier-weight pigs at approximately 225 pounds.

It is desirable also that both individual and group feeding be done.

Stations suggested to conduct the work outlined under (9) are:

Georgia	U. S. A. H. Experiment Farm
North Carolina	Virginia

✓(10) Mixture of ground shelled peanuts (10 parts) and tankage (1 part) self-fed, free choice, with mineral mixture.

The mineral mixture will be composed of steamed bone meal (50 parts), finely-ground limestone (25 parts) superphosphate (16%) (25 parts), and common salt (5 parts).

Pigs with initial weights of from 50 to 84 pounds are to be used and they are to be finished at an average weight of approximately 225 pounds.

Stations suggested to conduct the work outlined under (10) are:

Georgia	U. S. A. H. Experiment Farm
North Carolina	Virginia

Rice By-Products Experiments

(12) Rice polish, tankage, and mineral mixture self-fed, free choice, eight weeks followed by shelled corn, tankage, and mineral mixture, self-fed, free choice, eight weeks.

The mineral mixture will be composed of steamed bone meal (50 parts), superphosphate (16%) (25 parts), finely-ground limestone (25 parts), and common salt (5 parts)

Pigs with initial weights of 35 to 60 pounds are to be used in this study.

(13) Same as (12) except that rice bran is to be used in place of rice polish.

(14) Mixture of ground corn (10 parts) and tankage (1 part) self-fed, free choice, with mineral mixture.

The mineral mixture will be the same as given under (12).

Pigs with initial weights of 35 to 60 pounds are to be used and are to be finished at an average weight of approximately 225 pounds.

This is a check lot for comparison with lots handled in accordance with outlines under sections (12), (13), (15), (16), and (17).

(15) Same as (14) except that brewers' rice is to be used in place of corn.

(16) Same as (14) except that low-grade whole (hulled) rice is to be used in place of corn.

(17) Same as (14) except that rice polish is to be used in place of corn.

Stations suggested to conduct the work outlined under (12), (13), (14), (15), (16), and (17) are:

Arkansas

Iberia Livestock Experiment Farm

Cull Navy Bean Experiments:

(18) It was the opinion of the conference that the exact nature of the work for 1929-30 involving the feeding of cull navy beans should be determined by the Michigan Station and the Bureau of Animal Industry after the 1928-29 experiment is completed. The desirability of other stations cooperating in the study of the influence of cull navy beans on the quality and palatability of pork was pointed out.

Breed Experiments

(19) A study of the relation of the more common breeds to characteristics of the carcasses, when fed on standard rations.

Sows and boars, strictly representative of their respective breeds, are to be mated to produce purebred pigs for use in this study. The breeding animals and the pigs are to be fed and handled in such manner as to eliminate, so far as possible, all factors except breed.

The pigs of each breed will be fed to a finish weight of approximately 200 pounds.

In addition to other routine observations the pigs used in this study will be judged individually for market grade and type by a committee of three prior to slaughter. Also the carcasses will be measured for thickness of backfat and such other measurements, including length, depth, and width, as are regarded as indicative of type.

This study is a continuation of the work which has been in progress at the California Station for several years.

Stations suggested to conduct the work outlined under (19) are:

California
Others if possible

Influence of Pasture versus Dry Lot

(20) A study of the influence of grain feeding in dry lot and on alfalfa pasture during both the growing and fattening period on the characteristics of the carcasses.

A ration consisting of one pound of rolled barley with three pounds of skim-milk will be full fed twice daily both in dry lot and on pasture.

Mineral mixture composed of finely-ground limestone (10 parts), steamed bone meal (10 parts), and common salt (2 parts) will be self-fed to both groups.

The dams of all of the pigs used will be pastured on alfalfa continuously from time of breeding until the pigs are weaned. All the pigs will run on alfalfa pasture until they are divided into two groups for the pasture-dry lot comparison. This will be done when the pigs reach an average weight of approximately 50 pounds.

Stations suggested to conduct the work outlined under (20) are:

California
Others if possible

Velvet Bean Experiment

(21) The conference recommended continuation of the work involving the feeding of velvet beans which has been conducted by the Georgia Station and the Bureau of Animal Industry.

Cowpea Experiments

(22) The conference recommended repetition of the experiment involving the feeding of cowpeas which was conducted at the Coastal Plain Experiment Station in 1928-29.

Type Experiments

(23) A study of the relation of different types of hogs to the quality of the carcasses and products.

Three types of hogs- large, medium, and small- will be used in this study. The Poland China breed probably offers the best opportunity for obtaining three types, both other breeds may be used if three distinct, well-established types can be procured.

Purebred pigs, preferably of one line of breeding in each type, whose parentage is definitely known are to be used. It is important also that the type of both parents in each case be known to be well fixed.

It is recommended that the stations purchase the breeding stock for use in this study rather than depend upon the purchase of suitable pigs. It is desirable to obtain information in this study on breeding performance of the different types as well as on feeding performance and on the quality and palatability of the meat.

Where under the control of the station the breeding stock will be fed on rations consisting of corn, wheat middlings, tankage, alfalfa hay, minerals, and pasture. The pigs will be fed as follows:

(a) Mixture of ground corn (8 parts) and tankage (1 part) self-fed, free choice, with mineral mixture to sows and pigs till time of weaning (10 weeks).

(b) Mixture of ground corn (8 parts) and tankage (1 part) self-fed, free choice with mineral mixture from weaning to 100 pounds in weight.

(c) Mixture of ground corn (12 parts) and tankage (1 part) self-fed, free choice, with mineral mixture from 100 pounds to 200 pounds.

The mineral mixture will be composed of the following:

Steamed bone meal (50 parts), finely-ground limestone (25 parts), superphosphate (16%) (25 parts), and common salt (5 parts).

The pigs of each type will be fed to an average finished weight of approximately 200 pounds.

Stations suggested to conduct the work outlined under (23) are:

U. S. A. H. Experiment Farm
Others if possible

Influence of Age or Weight at Slaughter

(24) A study of the relation of age or weight at slaughter to the characteristics of the carcasses and meat.

The pigs will be started on experiment immediately after weaning.

The ration will consist of a mixture of ground corn (8 parts) and tankage (1 part) self-fed, free choice, with mineral mixture from weaning to 100 pounds weight. From 100 pounds to 225 pounds they will be fed a mixture of ground corn (12 parts) and tankage (1 part) self-fed, free choice, with mineral mixture.

The mineral mixture will consist of finely-ground limestone (10 parts), steamed bone meal (10 parts), and common salt (2 parts).

Periodic killings will be made from the group of hogs at average weights of 145, 180, and 225 pounds. At least five animals should be included in each killing.

This study may be conducted in connection with (7).

Stations suggested to conduct the work outlined under (24) are:

North Carolina
U. S. A. H. Experiment Farm
Others if possible

Retarded Growth Experiments

(25) A study of the influence of retarded versus normal growth on the characteristics of the carcasses and meat.

(a) Mixture of ground corn (8 parts) and tankage (1 part) with 5% alfalfa meal and 2% mineral mixture added, hand fed to produce pigs weighing 100 pounds at 9 months of age. From 100 to 225 pounds the pigs are to be given a mixture of ground corn (12 parts) and tankage (1 part) self-fed, free choice, with mineral mixture.

(b) Same as (a) except that the pigs are to be self-fed the mixture specified from weaning to 100 pounds. As soon as the pigs reach an average weight of 100 pounds they will be placed on the finishing feed.

The mineral mixture will consist of finely-ground limestone (10 parts), special steamed bone meal (10 parts), and common salt (2 parts).

The pigs will be started on experiment immediately after weaning. Each group will be finished at an average weight of approximately 225 pounds.

The feeding of the pigs from 100 to 225 pounds under section (b) of (25) may be conducted in connection with (7) and (24).

No particular stations were suggested to conduct the work outlined under (25). It was the opinion of the conference, however, that several stations should arrange, if possible, to undertake this study.

The conference recommended that such work as is now in progress on the influence of extremely softening and extremely hardening feeds used in the development of sows on the firmness of their pigs, be continued thru the current year and that it then be discontinued unless these results warrant further studies.

Some of the above are planned primarily as studies of firmness and related characteristics in pork; others are planned to involve a more detailed and complete study of the product, including, among others, cutting yields, laboratory observations, cooking and palatability studies. It is understood that work of the more complete nature will be continued in connection with as many experiments as possible, and especially in cases where the plan of experiments suggest the probability of obtaining clearcut differences in the meat.

The conference recommended that hereafter only pigs of definitely-known breeding and history, produced on the experiment station farms or under the control of the stations, be used in the cooperative pork studies.

Broadened Scope of Work

Mr. Hankins stated to the conference that "developments in work on meat investigations during the past few years have made it desirable for the Bureau of Animal Industry to discontinue the soft-pork project as such and to place our pork investigations on a broader basis by including a study of other characteristics of pork in addition to firmness. This matter was taken up in a preliminary way with our cooperators at the soft-pork conference at Asheville, N. C., in 1928. Our definite proposal to broaden the scope of cooperative work met with general approval. Representatives of

this Bureau then stated that beginning with the new fiscal year, or July 1, 1929, we would regard the investigations as pork studies instead of soft-pork studies. The plan which we have in mind is that the pork work should be made a part of the national cooperative project, "A Study of the Factors which influence the Quality and Palatability of Meat," placing it on an equal footing with the beef and lamb work."

"This new approach to the work means that there will be considerably more expense involved in carrying out our phases of the cooperative investigations than heretofore. More of our workers will participate in the studies, involving as they will the judging of type and market grade, carcass measurements, cutting yields, color measurements, mechanical tests for tenderness, histological studies, physical and chemical analyses, cooking and palatability observations, and it will be necessary for us to be relieved of certain of the expense which we have carried previously. I refer particularly to the transportation charges on the hogs which the Bureau has paid for a number of years."

"We believe that for some time it will be necessary to conduct experiments in which firmness of carcass and fats will be the most essential observations. In part of the experiments of this nature it will probably be desirable to carry out some of the other details indicated above. There will be other experiments in which all the detailed measurements and observations will be regarded as necessary. The exact procedure to be followed will need to be agreed on prior to the beginning of each experiment or series of tests."

"You will agree, I am sure, that it is only a logical development in pork investigations and a step of which the cooperative group should be proud. After all, firmness is only one characteristic and as research workers in animal husbandry we should be interested in and apply ourselves to the study of all the characteristics of pork as funds and facilities permit."

Recommendations

Motion was made and seconded that Mr. Earl H. Hostetler serve as a member of the grading committee representing the various cooperating experiment stations for the coming year. It was understood that Mr. Hostetler's expenses to Beltsville, Md., be borne by the cooperating stations pro rata.

Motion was made and seconded that all reports of experiments be submitted to the conference next year in a mimeographed form so that a copy may be distributed to each member present. It was also recommended that a standard form for reporting results be submitted by the General Committee and sent to the cooperating stations in time to prepare their reports accordingly.

The conference recommended that the 1930 conference be held at Asheville, N. C., after May 15, in order that the stations may avail themselves of the reduced railroad rates which go into effect about that time.

